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WOOL: ITS GROWTH AND USES.

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AS there are many different breeds of sheep fed upon pastures and in climates suited to their divers natures, there will always in consequence be wools of different qualities, causing a discussion of the subject to be surrounded with many considerations.

In dealing with the question it should be pertinent to first discuss the genesis of wool. It is known that if sheep do not receive the attentions of domestication — if they are allowed to revert to a free and wild state — the fleeces soon take on a hairy tendency, the skin becomes rougher, and the coating of it (the wool) too. When man began to pay attention to sheep so as to get the best results from them he soon realized that there were potentialities offering of making the available material plastic to his particular desires. He picked out the most likely sort of wool-bearing sheep and allied them in breeding, with the

result that he hastened along and accentuated the wool-growing habit. He did likewise with sheep showing the mutton form, and now there are the many different breeds in existence, some famed for wool-production, some for mutton, some of small carcase and some of large, the marked differences in them being largely accounted for by the skilful manipulation of the sheep-breeder working in circumspect accordance with natural conditions. Breeding is therefore an important factor in wool-perfection, and it is supported by the vital auxiliaries of feeding and attention.

The domestication of sheep commenced many scores of centuries ago, but it is only since the human race settled down to peaceful occupations and trade and commerce that vastly improved types of sheep have been bred up, until now there are many excellent kinds famous for respective qualities. The industry as carried out is strongly supported by the great calling of stud-sheep-breeding, which is undertaken with the object of maintaining and improving desired qualities.

There is still another way of approaching the subject of wool. Man's civilization requires wool; uncivilize him, however, and he could do without wool, which at any rate would not be forthcoming, for the contemporaneous liberation and uncivilizing of the sheep would cause its reversion to hairiness, and to paucity of carcase as well. Conclusively, therefore, the breeding of sheep for profitable wool or mutton qualities is an art of man brought about by his own artful or civilized methods of existence, and grasping this fact imposes upon the attention the necessity there is for selection and care in the breeding and feeding and attention of sheep so as to take the most out of the occupation.

Growing an abundant fleece in company with a quicker carcase or mutton result has now become a more important feature of sheep-farming than in years gone by. There did not then exist the demand there is now for mutton, and which now offers the inducement to combine its production with that of wool. This has necessarily popularized crossbreeding, for the differences in wool and mutton sheep are marked, and to obtain the dual result the attention naturally was drawn to crossbreeding. The Merino is a great wool-sheep with a carcase lending poorly to quick and profitable mutton-growing. However, like all animals living fairly close to nature, the flesh of the Merino has a peculiarly acceptable flavour. Excepting that it is as carefully bred as any other sheep, the Merino lives closer to nature than any other great breed. By uniting the animal with a longwool sheep, bred for the production of quicker-growing mutton, the mutton results of both are improved. The cross gives a fuller and quicker growing

carcase than the Merino, and a tastier and not so grossly fat carcase as the pure longwool. The cross also provides a superior kind of wool. It makes the fleece of the longwool denser, this being often desirable in certain country or climate, and it makes the wool of the Merino coarser and weightier, commanding always a good price — an acceptable factor, made more acceptable by reason of the extra profit taken from a more suitable mutton carcase.

Wool is getting scarcer; the output of it is not on the increase, but the numbers of the people requiring it, and who have to put up with various and inferior substitutes are increasing. Therefore any kind of wool fetches a good price providing it is well grown. Very often nowadays it is the mutton result that receives first thought. There are factors of a graduated nature to consider, however. With suitable land near market the fat lamb will usually return double what may be expected from the ewe's fleece. This is the most favourable state for mutton. Land not so good and farther away from market may place the consideration at half wool and half mutton; and land in the poorly accessible backblocks will exhibit consideration in favour of wool almost solely. Generally these states are met, in the first case, by using a mutton ram on crossbred ewes; in the second, by half-breeding the longwool ram with Merino ewes or crossbreeding; and in the last, by using only the pure Merino.

Market conditions are constantly changing by better accessibility, and it may be realized how impossible it is for farmers in the transitionary stage through which sheep-farming is passing, and observing the growing demand for mutton, to adhere in any way strictly to the culture of a particular kind of wool; but they can make a point of growing whatever wool they grow as well as they can, for wool in the aggregate of Australasian sheep-farming conditions is of greater value than mutton. It is essential, therefore, that, whatever may be the sheep-farming opportunities, well-fleeced ewes only should be used to breed from, and the fleeces should resemble one another as nearly as possible, for they and the flock's progeny then command a much higher price. This aim is attained in a high degree by the selection of even and well-fleeced rams in the first place, which are but rams that have been well bred in accordance with the laws governing sheep-improvement. If sheep with inferior-clad bodies are bred from there is the non-paying sacrifice of less wool to cut, and if the fleece shows kemps the manufacturer pays less for the wool, for kemps will not take dye, and the wool has therefore to be used in making an article that requires only second-rate wools.

A farmer in a district where mutton-production is the important direct or indirect factor does not require to strive at growing a class of wool that may catch his fancy from wool-market reports and quotations of prices—and this for many reasons. He may interfere with the mutton results of his flock, and he may tend to impose a crossbred flock upon his land which under modern conditions may not be quite suited to it nor pay the best. Also, he can realize that the improvements in the machinery of wool-manufacturers of late years are such as to enable them to use wools for many purposes that in the past had been confined to a few special uses. A manufacturer often has large stocks of fleeces on hand, and to what exact use he puts them he may not himself know until market requirements guide him at the last moment. Before finally manufacturing a kind of goods he can also sort the fleeces as he desires, as well as gather different sorts of wool into a blend, studying not only market conditions, but making the sorting or blending as economical to himself as possible —*i.e.*, he can use a greater or lesser quantity of the good or the inferior parts of fleeces. He makes necessity and economy guiding factors.

The manufacturer also works under the knowledge that all kinds of wool can be used in the production of woollen garments, but that certain kinds of wool can only be used in the manufacture of worsteds. So, therefore, as the manufacturer strives towards liberal and wide use of the product of the wool-grower, the wool-grower can in turn aim towards the suitability of his breed of sheep for the particular kind of country and available market he may have, resting assured that whatever kind of wool he grows, if it is grown well, will be in good request. He should also realize importantly that when his class of country and degree of accessibility at all suggest the use of the pure Merino he should by all means stick to that breed, for the Merino flocks of the world are so rapidly decreasing through the growing popularity of crossbreeding that fine Merino wool will soon be a most valuable luxury. He may have to wait an extra year for a lamb from his Merino ewe, but he can probably carry one thousand Merinos better on his mediocre country than six hundred crossbreds.

Dealing with the breeds of sheep popularly known in Australasia, the following table quotes them in order of the fineness of their wools. The finest-woolled, the Merino, is stated first, and the others gradiently down to the Lincoln, which is the coarsest. The quality of their wool-tops production is also stated, and the approximate length of staple of their fleeces as well. "Tops" in the wool trade are the combed fibres of the wool after they

have been treated in the combing-machine, the noils or short fibres having been separated therefrom. Higher the quality number of the tops, like Merino 80's, finer is the wool; lower the number, like Lincoln 36's, coarser is the wool composing it. The term "80's" means that the particular wool in the top should spin to such a length of yarn that it will take 80 hanks, each of 560 yards, to weigh 1 lb. of the spun material — *i.e.*, of clean, scoured tops, not of greasy wool; and so on for 60's, 50's, &c., in corresponding numbers of hanks.

Breed.	Quality.	Length of Wool Staple. Inches.
Merino	60's to 80's	2 to 3
Southdown	50's to 56's	4 to 5
Half-bred	50's to 56's	..
Threequarter-bred, longwool side ..	46's to 48's	..
Shropshire	46's	6
Romney	44's to 46's	8
Leicester	40's	9
Crossbred	40's (about)	..
Lincoln	36's	12 to 15

The uses to which these wools are put may be approximately stated as follows:—

Merino ..	.. Light fabrics, soft serges, flannels, &c.
Southdown	.. Variety of cloths for everyday wear and for blankets.
Half-bred ..	.. Serges, worsteds, &c.
Threequarter-bred ..	.. „ „
Shropshire	.. „ „
Romney ..	.. Woollens.
Leicester ..	.. Hosiery, &c.
Crossbred ..	.. Serges, &c.
Lincoln ..	.. Lustrous serges, &c.

There are two extreme uses to which wool may be put—the finer sort, such as the Merino, for light and soft fabrics for women's wear, &c.; and the coarser kinds, approximating to hairiness, like the Highland breed, for coarse things like carpets, for which much of this breed's fleece is only suited, but a small part being employed in making special rough suiting-material for sporting wear. The wool of the Highland breed is much coarser than that of the Lincoln.

The fleeces of the longwools are heavily sorted by the manufacturer, fine crossbred to a lesser extent, and the Merino, growing

a more even fleece, still less. Evenness of fleece always suggests less requirement for sorting, and greater inducement for the buyer to give for this reason a higher price. The following is the extent approximately to which, say, 100 lb. weight of Lincoln or Leicester fleece is sorted under what the sorters term the Scotch method. The fleece is spread upon the table, and the different qualities are taken from it in the order of their merit :—

	lb.
Fine matchings (best part of shoulders), 40's to 44's ..	7*
Blue matchings (from the shoulders), 36's to 44's ...	62†
Neat matchings (from the sides), 32's to 34's ..	19
First brokes (skirting or edge of fleece)	2
Second brokes (skirting or edge of fleece)	3
Third brokes (skirting or edge of fleece)	1
Britch (from the tail and thighs)	4
Toppings, waste, &c.	2
Total	100

* 13 lb. for Leicester. † 56 lb. for Leicester.

The bulk of the fleece of each breed of sheep is eminently suited for certain uses, and the excellence of modern machinery, as already referred to, can still further widen the scope of use of each. Short-stapled wools, which have many more serrations per inch of fibre than the longer wools, have great adaptability for the manufacture of woollens; the serrations help to readily lock the fibres into one another in the felting or milling process. On the other hand, with less serrations and crimps to each inch of wool-fibre of the longwools, their fleeces, or the better parts of them, are more adapted for worsted-manufacture, which consists of the process of combing the fibres so as to lay one alongside of the other. Short-stapled wools are preferred for such things as flannels, blankets, broadcloths, jerseys; long, lustrous wools for worsted suitings, serges, &c.; and long- and short-stapled wools are frequently combed and made into flannels, suitings, underwear, &c.

The uses to which wool are put are very liberal, and a lot depends upon the quality of the particular fleeces and the necessities of the manufacturer, who may often be compelled to use a wool of a certain description for the production of an article that it may not be eminently suited for, but for which at the time there is no quite suitable wool available. As indicated above, intermixing the fibres irregularly into a felted mass of cloth with a soft elastic finish is the woollen process; stroking or combing

the fibres repeatedly so as to lay them parallel with each other, then twisting them into a yarn or rope and manufacturing into goods presenting a regular and lustrous surface, is the worsted process.

Wool-buyers always take into consideration such questions as the impurities of the clip, among which are twigs, burrs, sand, &c., and offer their price accordingly. When a clip is very full of vegetable impurities English buyers as a rule do not bid (although at latest English manufacturers are introducing special cleaning plants), and the clip finds its way to the Continent of Europe, where many firms make a speciality of treating such wools. They have the plant for dealing with them, and the process is termed "carbonizing," which, shortly, takes the form of submitting the wool to treatment with sulphuric acid, then exposing it on a floor to dry at a high temperature. After the wool has dried the acid acts upon the vegetable matter by reducing it to ashes that are dissolved out when the wool is scoured. As this process takes time and money, it can be understood that a wool-grower by securing cleanness of clip saves such cost, which will go into his own pocket by way of a higher price.

The yolk or fat of wool is a natural feature of the latter, playing a useful part from the commencement of the growth of the fleece to the day when it is scoured. Its presence in the fleece serves as a most valuable protection to the sheep from harm by much rain, and to the wool in preserving its soft and pliable condition for manufacturing purposes. Much rain entering to the skin of the sheep, which it would easily do in the absence of yolk, would cause injury to the animal's constitution, besides deteriorating the wool, which would become dry and harsh. Acting as a natural soap, yolk also serves a most useful purpose in facilitating the scouring of the wool, and the manufacturer saves the yolk residue for use in cleansing finished garments.

DANTHONIA IN NEW ZEALAND.

A. H. COCKAYNE, Biologist.

THE two composite species of danthonia that are used in pasture formation in New Zealand are *Danthonia semiannularis* and *D. pilosa*. The writer uses the term "composite" species, as they both vary very much, and it is probable that both species really consist of a large number of strains, but whether these are the result of cross-fertilization or are really permanently fixed strains has never been determined. Suffice it to say that in different localities the difference is sufficiently great to be of economic importance. Certain forms yield more herbage than others, and at times they are superior for the soil on which they are growing to any of the so-called English grasses. In other localities the dominant form, owing to its sparse development of herbage and the rapidity with which the leaves dry up, is of comparatively little use. From this it will be seen that in seed-harvesting it is necessary to gather from areas where the grass has produced a serviceable pasture. Hawke's Bay and Nelson *Danthonia pilosa* and Auckland *D. semiannularis* are held to be the best, but there are many other districts where useful forms predominate.

The seed of *Danthonia pilosa* is distinguished from *D. semiannularis* by being much larger, and in not having a complete ring of hairs about half-way up the back of the seed. In *pilosa* there is sometimes an interrupted ring of hairs, but generally the back of the seed is virtually bare. From many weights that I have made the number of seeds per pound averages 550,000 for *pilosa* and 900,000 for *semiannularis*. The seedling of *pilosa* is, however, more vigorous than that of *semiannularis*, so that for seeding purposes a pound of *pilosa* can be looked upon as equivalent to a pound of *semiannularis*.

In habit the two grasses are distinct, *semiannularis* having the longer leaves, and the plant being more erect and tussocky, not tending towards the production of a close sward. *D. pilosa* forms a comparatively close sward, and with heavy stocking a quite level sward is produced; but the tendency is for the grass to get away and dry up, when its stocking-capacity is much reduced. If it is kept short a very considerable amount of fairly succulent herbage is produced.

SEED OF DANTHONIA SEMIANNULARIS (SMALL-SEEDED DANTHONIA).
Magnification 6 diameters.

SEED OF DANTHONIA PILOSA (LARGE-SEEDED DANTHONIA).
Magnification 6 diameters. *[Photos by E. B. Levy.*

In the early days of the use of danthonia in New Zealand *semiannularis* was mainly used, but owing to the advice of the Department *pilosa* is now mainly used, as it is for general purposes by far the superior form. *D. semiannularis* is still used in scrubby (manuka and fern) country where, after sowing, burning from time to time is necessary. The reason why *pilosa* is not used so largely in this case is due to the taller and drier growth of *semiannularis* carrying a fire so much better.

Much second- and third-class country in New Zealand originally sown with rye, cocksfoot, &c., is now almost pure danthonia pasture, it having come into this grass naturally and through stocking with sheep previously pastured in danthonia country, the fleeces carrying and distributing the seed. Much of the best danthonia country is quite two-sheep country, and it can be therefore realized that its development into this type of pasture has been a boon to the Dominion. Again, much of the original lowland tussock (*Poa australis*) sheep-country is now mainly danthonia, and carries far more stock than formerly. It must be noted, however, that danthonia is not advocated on rich land, but only on soils where rye-grass and cocksfoot will not succeed. Another point to be considered is that danthonia is never sown on ploughed land except under special conditions, such as pumice country, but is practically always sown on the ashes on third-class forest land or on burnt scrub or fern county.

The amount of seed used per acre varies. In general, far too little is sown, but the price is a bar in this particular, and it is hard to persuade farmers that it is necessary often to spend more on the seeding of inferior country than it is on good land. On poor country, where the better grasses do not hold more than a few years, it is now customary to include from 2 lb. to 6 lb. of danthonia in the mixture. On country originally sown with English grasses, but which has developed into fern and manuka, large amounts of danthonia with some cheap grass like Yorkshire fog should be used; really from 12 lb. to 16 lb. per acre would be best, but such amounts are rarely used. The best time to sow is from the end of January to the end of March. Danthonia is fairly slow to develop, hence the necessity of using other grasses to cover up the land rapidly. However, when once established, danthonia spreads rapidly, owing to its habit of seeding even when fairly heavily stocked. When kept well down it is excellent sheep-pasture, but by autumn it has often got away, and the dry herbage is then very inferior for sheep during the winter. Burning is often resorted to, but although effective this is a wasteful method. The best results have followed cattle-stocking (steers a year and a half to two

years and a half old) in the autumn and winter. This, of course, is only necessary where the herbage has got hard, dry, and long. In the North Island *pilosa* grows well during the winter and yields very palatable feed, and it is for this reason that its average carrying-capacity is fairly high.

Danthonia stands frost well, but I am inclined to think that the better forms are more suited to lowland than upland conditions. I am convinced that danthonia would respond amazingly to top-dressing, but experiments in this treatment have not been carried out on an extended scale. Phosphates, both in the form of super-phosphate and basic slag, have, over limited areas, given astonishing results. Danthonia is only suitable for pasture, and as it is generally sown on country too rough for haymaking this is no drawback.

Sowing is always done broadcast by hand, and the seed is very difficult to sow owing to the seeds matting together, *semiannularis* being especially bad in this respect. In windy weather it is almost impossible to make an even cast.

The seed is mainly harvested by hand by Maoris, the heads only being cut, and the seed flailed, coarse riddles being used to remove the straw. Where there is a good crop of seed and the country is sufficiently level stripping is adopted with very satisfactory results. Areas should be shut up for seed about the end of October and the seed harvested in January. The seed falls badly when ripe, and the practice is to harvest it when not ripe enough, hence the germination is often inferior. Good lines should germinate over 80 per cent., but an average germination of 50 per cent. can be considered satisfactory. Owing to the fluffiness of the seed, machine cleaning is out of the question, and samples often contain large amounts of hair-grass and fog. These impurities are of no moment, as their presence on the type of land on which danthonia is sown cannot be looked upon as harmful.

It has been part of my duty at the Board of Agriculture to make a study of the agriculture of Germany, and in the course of my work it became apparent to me that if agriculture had made no more progress in Germany than it has in the United Kingdom during the period 1895 to 1915 the German Empire would have been at the end of its food resources long before the end of the second year of the war, and that, as a matter of fact, the war was being fought by it just as much on an agricultural as on a military organization of the nation.—*Lord Selborne, when President of the English Board of Agriculture.*

FRUIT-PRESERVING IN THE HOME.

T. E. RODDA, Orchard Instructor, Timaru.

During the season when fruit is plentiful every housewife should endeavour to preserve as much as possible for use during the winter and spring months. The modern method of fruit-preserving does not appear to be as widely understood as one would imagine. Many people seem to think that the process requires considerable skill and previous experience, but such is not the case. Any person with average intelligence, provided he or she exercises ordinary care and thorough cleanliness, can quickly become proficient in the work. In this article it is not my intention to explain the factory method. My aim is to describe a process made as simple as possible by utilizing appliances to be found in the average home.

Any class of fruit can be preserved successfully provided it is fresh, not overripe, and free from bruises. All badly bruised fruit should be rejected and can be made into jam. The major portion of fruit preserved is processed in sugar syrup, but I wish to stress the point that it is not essential that the fruit should be so treated to ensure the product keeping for an indefinite period. Pure water will do equally well. The whole secret of preserving is thorough pasteurization, or the killing by heat of the ferment germs contained in the fruit, and hermetically sealing the jars or containers while the whole is still hot. Sugar syrup certainly makes the fruit more palatable, especially if it is intended for consumption as a cold dessert. In such case the use of syrup is advised, but in the case of pie-fruits, or fruits intended for cooking or to be eaten hot, water alone is sufficient. Sugar can then be added according to taste.

For general home preserving the fruit should be put up in bottles or jars, which are obtainable at reasonable rates. Possibly the best makes or brands of jars are the "Lightning," "Atlas," and "Golden State Mason." The latter is an exceptionally good jar, having a very wide mouth, an advantage that needs no comment.

MAKING THE SYRUP.

The syrup should be made before the fruit is prepared for processing. The strength of syrup most generally used is 1 lb. sugar to 1 gallon of water. This can be increased to 3 lb. and even 4 lb. per gallon, according to the variety of fruit under treatment. To

prepare the syrup place the sugar with the requisite amount of water in a saucepan on the kitchen-range, and heat to nearly boiling-point, stirring meanwhile. Remove from the fire and let stand until required.

PREPARATION OF THE FRUIT.

For convenience in cooking, pears should be halved or quartered, peaches and apricots halved and pits or stones removed, cherries stoned, and quinces cut into slices or cubes. Plums are treated whole. Pears, peaches, and quinces require peeling, but the other fruits can be cooked with the skin on.

The peeling process in the case of peaches is a very tedious operation if a large quantity is being prepared. The skin or fur can, however, be quickly removed by placing a few fruits at a time—say, ten or a dozen—in a netting bag and dipping them for a few seconds into boiling weak lye made of 1 lb. caustic soda to 7 or 8 gallons of water. The fur is then easily rubbed off by wiping with a rough towel. Care must be taken that the fruit is not allowed to remain in the lye too long. The time can usually be judged with the dipping of the first bag. If the skin still clings on removal, allow to remain a little longer, but if the skin and a little flesh as well comes away with the towel, decrease the period of immersion by a second or so.

After the skin is removed the fruit should be thoroughly rinsed in clear water, and then cut in halves. In the case of freestone peaches, this is quickly and easily done by cutting round the fruit with a knife and pulling apart. Clingstones present a different problem, but the difficulty can be overcome and the pit extracted neatly and quickly if the following method is adopted: First procure an old but strong teaspoon, and cut the broad portion off the handle. Next obtain a piece of hard wood about 1 in. by 1 in. and 4 in. or 5 in. long. With a gimlet bore a hole lengthwise in one end, long enough and large enough to insert the handle of the spoon so that it fits firmly. Spokeshave the wood smooth, and round off the top so that it will not injure the palm of the hands whilst in use. Sharpen the end and edges of the spoon with a file, and the pitting-knife, as it is now called, is ready for use. To remove the pit take the fruit between the thumb and a finger of the left hand, and place the flower end down on a flat board on the table, but keeping the suture of the fruit parallel with the side of the table from which one is operating. Retaining a grip on the fruit, insert the point of the knife—concave side towards one—at the stem end of the fruit, and press down so that the blade cuts round the farther side of the stone or pit. Withdraw

the blade, turn the fruit round, and again insert the knife at the same point, repeating the cutting motion. Then with an ordinary knife cut the fruit in half by following the line of suture, when the pit will fall free.

The fruit should next be placed in a brine bath composed of 1 lb. of salt to 1 gallon of water, to prevent discoloration until sufficient fruit is prepared for packing in the bottles. When sufficient fruit is prepared it is packed neatly in the jars, which have been thoroughly cleansed by washing in warm water. The jars are then filled with syrup or water, as the case may be, and the caps screwed on lightly without the rubbers. The whole is now ready for boiling.

THE BOILER AND COOKING-PLATFORM.

The ordinary household washing-copper makes an excellent boiler for boiling the fruit, provided it is thoroughly scoured out beforehand. A wooden platform should be made, with two or three blocks of wood 3 in. thick and about 7 in. long nailed on the under-side to support it, without allowing its edges to actually touch the sides of the copper. This precaution prevents the platform from jamming when it is being hoisted out of the copper. Two wire handles reaching barely to the copper's brim are next attached to the platform, to enable the operator to lift both platform and bottles out when the fruit is sufficiently cooked. This can be improved upon still further by placing a small pulley in the ceiling of the wash-house directly over the centre of the copper, to allow of a strong cord being passed round and attached to the handles of the platform. With such an attachment it is a very easy matter to hoist the whole bodily out of the copper, place two narrow boards over the top of the copper, and lower the platform on to them, removing the jars of fruit as soon as the caps are screwed on.

COOKING THE FRUIT.

The bottles should be placed on the platform in the copper so that they do not actually touch one another. Now place water in the copper until it reaches to within 1 in. or 1½ in. of the top of the bottles, place the lid on the copper, start the fire, and bring the whole to the boil. The times for boiling the various fruits are shown in the table on opposite page, and are calculated from the moment the water in the copper starts to boil. When the fruit has finished boiling hoist the platform out of the water, remove the caps, fill the bottles to the brim with boiling syrup or boiling water, as the case may be, place a new rubber that has been rinsed in hot water under the cap, and screw down tight. The bottles should then be

stood on their heads and allowed to cool. Just here a word of warning: Never place the jars to cool in a spot where they are likely to be struck by a current of cool air, because such a condition of atmosphere will often cause some of the jars to crack or burst.

Tomatoes do not require cooking like the other fruits mentioned. The following is a very satisfactory and simple method: Select medium-sized and firm fruit, and cleanse the skins by washing in warm water. Before placing in the bottles it is advisable to puncture the skin of each fruit in five or six places with a sharp skewer or darning-needle, to prevent its bursting while in the boiler. After placing the tomatoes in the bottles each bottle should be filled with water and placed in the boiler, and the whole brought to the boil. Immediately boiling has commenced hoist the jars out and screw on the caps.

Currants can be preserved in a similar manner, or cooked for eight or ten minutes in heavy syrup.

The following table shows the times required to cook the various fruits, also the quantities of sugar to be added to a quart of water for preparing the syrup. The figures have been taken from a paper by Mr. E. Shelton, Instructor in Agriculture, Queensland. I have tested these figures in actual practice for two seasons, and have found the times for cooking and the quantities of sugar as stated to be very satisfactory, but of course the quantity of sugar can be modified according to taste.

Variety of Fruit.	Time for Cooking. Minutes.	Quantity of Sugar to Quart of Water.
Pears (halved)	20	6 oz.
Peaches (halved)	8	4 oz.
Peaches (whole)	15	4 oz.
Apricots	15	4 oz.
Quinces (sliced)	15	10 oz.
Gooseberries	8	8 oz. or more.
Plums	10	8 oz.
Cherries	5	6 oz.
Tomatoes	Bring to boil	None.

(NOTE.—The time of cooking is judged from the time the water in the copper commences to boil.)

The New Zealand Holstein-Friesian Association has decided to drop the word "Holstein" from its name, which henceforth will be New Zealand Friesian Association.

CERTIFICATE-OF-RECORD DAIRY COWS.

W. M. SINGLETON, Assistant Director, Dairy Division.

THE appended list shows the records of those cows and heifers which have completed their year's production and freshened again subsequent to test since the last return was published in the *Journal* for July last. The list contains the name of many individuals that have placed a splendid production to their credit, but space will not permit special reference to each of these. Attention, however, is directed to four new class leaders.

Flossie of Koputaroa now heads the list for mature Ayrshires. Her record is more creditable than the figures suggest. She commenced her test on the 14th July, 1915, and was milked on test 358 days, calving again on the 12th July, 1916, or within the year.

Meta, a junior four-year-old Friesian, was milked only 346 days, and dropped her subsequent calf some seven days under the twelve calendar months, but has nevertheless placed to her credit the leadership of her class.

The Jerseys have two new leaders in Lady Peggy and Mere. Both these animals were more fortunate than Flossie of Koputaroa and Meta, and had an opportunity to milk for the usual 365-day period. Lady Peggy becomes the leader of the senior two-year-old class. Her calving subsequent to the testing-period was thirteen months and four days after commencing her test.

Mere's record was the subject of some comment in last month's *Journal*, and although she commenced her test at the age of 1 year 346 days she is classified as a junior two-year-old. Her outstanding production of 663·64 lb. fat in 365 days, with twice-a-day milking and little supplementary feed, creates a very high standard for junior two-year-olds. Our testing officer, Mr. Boyd, has advised that Mr. McRae provided Mere with good pasturage during her milking-period, and that besides this she was fed during her year an aggregate of about 16½ bushels of oats. Also 40 lb. of mangels per day were fed to her from 1st May to the finish of her testing-period in September. Surely few records of this calibre have been produced at so low a cost for supplementary feed.

SNOW QUEEN'S FANCY.

Jersey Senior Two-year-olds.

MONAVALE NOBELTJE VEEMAN.

Friesian Senior Two-year-olds.

LIST OF RECORDS.

Name of Cow and Class.	Name and Address of Owner.	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk	Fat
JERSEYS.						
Junior Two-year-olds.		Yrs. dys.	lb.		lb.	lb.
Bella of Bull's ..	Dr. F. J. Watson, Bull's	1 249	240·5	310	4863·50	254·96
Lynwood's Heather..	J. F. Vosper, Matamata	2 165	257·0	363	5868·70	351·19
Lilac of Beachlands..	F. Adam, Hoanga, Dargaville	1 355	240·5	350	6508·20	367·59
Trelawny Lettuce ..	T. B. Insoll, Eureka..	1 349	240·5	313	6847·70	310·17
Nelson's Olga Chase..	W. J. Hall, Matatoke	1 350	240·5	355	5199·80	300·33
Sunlock's of Jersey Meadows	H. H. Phillips, Te Rehunga	1 327	240·5	365	6378·70	380·88
Belvedere Briar-bud	E. Eagle, jun., Belvedere	1 336	240·5	328	4963·30	280·51
Belvedere Countess ..	Ditto	2 11	241·6	365	7056·30	366·49
Belvedere Rose-bud	,, ...	2 22	242·7	337	6166·90	361·32
Belvedere Maiden's Blush	,, ...	1 357	240·5	331	6450·10	370·64
Mere	F. S. McRae, Palmerston North	1 346	240·5	365	12164·00	663·64
Middlewood's Lady..	D. H. Kilgour, Kiwitea	1 237	240·5	277	6733·00	292·57
Mercedes Lady ..	E. Griffiths, New Plymouth	1 348	240·5	246	4801·50	275·72
Miro Meadows Myrtle	A. A. Ward, Miro ..	1 350	240·5	365	5302·50	315·98
Miro Meadows Duchess	,, ,, ..	1 351	240·5	365	6546·50	398·73
Poppy's Princess ..	H. Purdie, Brixton ..	1 356	240·5	365	6306·80	330·91
Avalanche's Pride ..	,, ,, ..	1 355	240·5	365	4547·80	242·88
Starlight's Mary Chase	W. J. Hall, Matatoke	1 327	240·5	365	5200·50	321·30
Crystal Starlight's Chase	,, ,,	1 357	240·5	363	6478·90	356·39
Golden Empress ..	Charles Goulter, Renwicktown	2 30	243·5	365	6728·70	345·55
Rozel's Zeila ..	W. V. Harkness, Tariki	2 79	248·3	276	5750·00	314·97
Rozel's Zephyr ..	,, ,,	2 15	242·0	247	4663·20	271·78
Rozel's Maple ..	,, ,,	2 19	242·4	260	4116·70	265·62
Tu Tu	James Penney, Blenheim	1 176	240·5	346	5234·50	257·80
Senior Two-year-olds.						
Waipiko Maggie ..	F. Adam, Hoanga, Dargaville	2 356	276·1	331	5265·85	282·83
Jewel's Mystery ..	J. F. Vosper, Matamata	2 313	271·8	309	6276·50	444·59
Golden Swan's Lady	A. Moreland and Sons, Papatoetoe	2 307	271·2	365	9459·60	515·50
Belvedere Sunray ..	E. B. Eagle, Belvedere	2 327	273·2	365	8461·90	538·94
Miro Meadows Favourite	A. A. Ward, Miro ..	2 323	272·8	365	7004·90	435·21
Snow Queen's Fancy	C. A. Willis, Pukekohe	2 359	276·4	365	8537·5	562·05
Lady Peggy ..	E. Griffiths, New Plymouth	2 357	276·2	365	9625·50	650·00
Junior Three-year-olds.						
Mulberry	R. D. Harkness, Te Horo	3 11	278·1	340	6656·10	345·97
Rozel's Favourite ..	W. V. Harkness, Tariki	3 4	277·4	276	4892·20	284·06
Senior Three-year-olds.						
Eminent's D. Norah	F. E. Hellyer, Dunedin	3 281	305·1	341	8290·00	441·16
Friskey Goldie ..	Dr. F. J. Watson, Bull's	3 344	311·4	365	10090·20	569·81
Golden Swan's Maid	A. Moreland and Sons, Papatoetoe	3 214	298·4	365	10589·30	543·31
Majestic Lady ..	R. D. Harkness, Te Horo	3 307	307·7	351	7153·80	409·84

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Name and Address of Owner.	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*	Yrs. dys.	lb.		lb.	lb.
Senior Three-year-olds —continued.						
Lady Surprise ..	T. Foreman, Alton ..	3 339	310·9	325	6380·30	356·32
Golden Swan's Girl ..	A. Moreland and Sons, Papatoetoe	3 314	308·4	365	12040·00	563·55
Rosegrove ..	E. O'Sullivan, Cardiff	3 195	296·5	359	5650·00	361·56
Soumise Duchess ..	Charles Goulter, Renwicktown	3 335	310·5	365	8547·20	425·38
Jersey Queen Darkie	Ditto	3 255	302·5	365	7539·40	342·14
Junior Four-year-olds.						
Floss IV Campanile..	H. Stratford, Awapuni	4 0	313·6	365	8234·50	466·33
Snow Bird.. ..	C. A. Willis, Pukekohe	4 25	316·0	316	9915·60	468·09
Sultan's Lass ..	H. L. Spence, New Plymouth	4 10	314·5	365	10073·20	580·40
Senior Four-year-olds.						
Lassie's Duchess ..	Ranford Bros., Stratford	4 259	339·4	362	7544·80	469·79
Malaprop's Lassie ..	Ditto	4 340	347·5	365	7773·00	435·42
Bella's Jewel ..	J. F. Vosper, Matamata	4 323	345·8	335	6142·80	346·14
Shining Star ..	Estate of H. B. Curtis, Inglewood	4 341	347·6	355	8759·90	422·86
Mature Class.						
Lady Campbell ..	H. C. Sampson, Hillsborough	5 36	350·0	326	7538·50	405·74
Necklace	Estate of H. B. Curtis, Inglewood	5 242	350·0	365	7772·90	406·69
Grey Heifer ..	H. Stratford, Awapuni	10 163	350·0	303	8399·00	435·92
Lady Flora IV ..	R. D. Harkness, Te Horo	10 90	350·0	353	6207·70	439·65
Nukumaru Topsy I	Ditto	5 352	350·0	342	7834·20	438·45
Lady Starlock ..	A. Moreland and Sons, Papatoetoe	10 311	350·0	365	10159·60	588·79
Verbena of Meadowbrook	E. Hodges, Waimana	9 12	350·0	339	6620·00	369·27
Snow's May ..	J. F. Vosper, Matamata	6 312	350·0	358	7162·70	390·13
Orange Lily III ..	T. S. Edwardes, Tiakitahuna	6 362	350·0	275	6516·40	351·36
	FRIESIANS.					
Junior Two-year-olds.						
Heilo's Torohunga No. 1	W. Barton, Featherston	1 304	240·5	365	11210·20	358·96
Monavale Ina Hengerveld	C. C. Buckland, Cambridge	1 353	240·5	365	10414·80	305·00
Monavale Inka Butter Girl	Ditto	2 164	256·9	365	10961·40	382·49
Monavale Korenbloem	,, ...	2 150	255·5	365	10588·60	460·17
Domino's Colantha Lass	W. McLachlan, Doyleston	2 34	243·9	305	14110·10	465·06
Lakeside Canary Indi	A. J. Gallichan, Tiakitahuna	2 47	245·2	296	8340·20	256·65
Senior Two-year-olds.						
Monavale Maida de Kol	C. C. Buckland, Cambridge	2 220	262·5	365	11219·20	412·91
Lady Fayne ..	James Hart, Raumati	2 243	264·8	365	14667·10	498·66
Diana de Kol ..	James Parkinson, Opotiki	2 358	276·3	352	10005·20	351·21
Nazli Fayne Segis ..	Newton King, New Plymouth	2 363	276·8	365	11163·80	405·11

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Name and Address of Owner.	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
Senior Two-year-olds—continued.	FRIESIANS—*continued.*	Yrs. dys.	lb.		lb.	lb.
Monavale Edith Pontiac Hengerveld	C. C. Buckland, Cambridge	2 192	259·7	365	10410·10	357·87
Monavale Nobeltje Veeman	Ditto	2 339	274·4	365	14542·80	525·84
Junior Three-year-olds.						
Pietertje's Colantha..	W. Remnant, Palmerston North	3 75	284·5	287	11557·30	401·96
Pontiac Lady de Kol	James Parkinson, Opotiki	3 52	282·2	355	10503·60	379·05
Junior Four-year-olds.						
Meta	George Aitchison, Kaitangata	4 24	315·9	346	18285·75	675·06
Senior Four-year-olds.						
Sadie de Kol ..	W. I. Lovelock, Palmerston North	4 298	343·3	365	12319·30	391·95
Mature Class.						
Glendowie Cornflower	C. C. Buckland, Cambridge	*	350·0	365	12962·30	545·04
Lady Elnora Pauline	James H. Parkinson, Opotiki	*	350·0	353	9410·40	350·73
Colantha of Ormstown	H. North and Sons, Omimi, Seacliff	8 175	350·0	329	13326·80	439·05
Two-year-olds.	AYRSHIRES.					
Lily White of Hagbourne	C. Woodley, Newbury	1 334	240·5	330	6511·90	272·69
Ellesmere Lass ..	F. S. Veale, Woodville	2 122	252·7	346	9034·40	328·93
Mature Class.						
Flossie of Koputaroa	C. E. C. Webb, Koputaroa	8 348	350·0	358	13733·80	571·48
Daisy II of Hagbourne	C. Woodley, Newbury	6 339	350·0	325	9192·90	467·42
Two-year-olds.	SHORTHORNS.					
Joyse II of Hillview	J. C. Wright, Matapu	2 215	263·0	365	9860·00	365·34
Mature Class.						
Fancy	R. Turnbull and Sons, Sentry Hill	6 316	350·0	365	10527·00	423·62
Myrtle	Ditto	9 44	350·0	365	10268·10	362·14

* Mature.

The cereals sown with tares for green feed at Weraroa last autumn did very well, and were fed to the dairy cows this spring. Barley and tares were the heaviest crop, but the rye-corn and tares, and wheat and tares, while very little behind the barley mixture in weight of fodder per acre, were of much better quality, and preferred by the cows. Oats and tares were the lightest crop, but made very nice feed. A large part of these crops, not being required for feeding out, is being made into ensilage.

ANTE-PARTUM PARALYSIS OF EWES.

A NOTE FOR SHEEP-FARMERS.

C. J. REAKES, D.V.Sc., M.R.C.V.S., Director, Live-stock Division.

ANTE-PARTUM paralysis of ewes causes every year a considerable amount of mortality, which could be avoided if the necessary, simple, and effective preventive measures were always taken by owners.

The trouble is caused by the ewes being too fat, and consequently, when heavy in lamb, particularly when carrying twin lambs, becoming lazy and sluggish and taking too little exercise. The system becomes plethoric, and fat is deposited in the internal organs, particularly the liver and kidneys, whose activity in performing their natural functions is consequently reduced to such an extent that the condition termed ante-partum paralysis is set up.

When this trouble makes its appearance in a flock it can be quickly brought to an end by the simple measures of giving compulsory exercise and at the same time reducing the feed, or changing the ewes on to young succulent green-feed—young oats, for instance.

Some striking instances of the value of this practical and simple method of treatment are furnished by Mr. F. Mackenzie, Inspector of Stock, Christchurch, who, with Mr. W. C. Barry, M.R.C.V.S., Veterinarian, has advised several farmers on the Canterbury Plains in the matter this season. Below are Mr. Mackenzie's remarks:—

Following are the facts in connection with one of the worst cases of ante-partum paralysis that has come under my notice for many years.

On the 18th September Mr. ——, of ——, telephoned that he had a heavy mortality among his breeding-ewes. In company with Mr. Barry, M.R.C.V.S., I immediately proceeded to the farm, and found that twenty-three ewes had died on the Saturday and ten on the Sunday (the two previous days) out of a small flock of about two hundred and fifty ewes. About ten additional ewes were showing the first symptoms, and several more were in a doubtful state.

These ewes did not at first sight appear to be overfat, but on making a post-mortem examination we found them one mass of fat internally. I could see by the way they were lying about that they took little or no exercise. I learned from the owner that he had another small farm about two miles farther along the South Road. I advised him to drive his ewes quietly along to this farm in the forenoon and back again in the evening for a few days.

I am enclosing a letter from him, and you will see from this that the mortality was immediately stopped, and, with the exception of one, all the ewes which were visibly affected recovered. [This letter reads as follows: "In answer to your letter as regards sheep, I may say that I only lost one after you were here, and that was the one to which we gave the oil. I carried out your recommendation, shifting them about, and I am quite sure if I had not done so I would have lost more. They are lambing away yet and doing well."]

On another farm in the district an owner of a flock of five hundred ewes lost fifteen ewes in three days. I visited this farm, and recommended shifting the ewes to fresh paddocks and giving them as much exercise as possible. The owner now informs me that the ewes have all lambed, and that on carrying out my recommendations he had no further mortality.

In the same district another owner was losing three or four ewes daily out of a flock of seven hundred sheep. On exercising the sheep twice daily the mortality immediately ceased.

Numerous other cases can be quoted, but I think the foregoing will be sufficient to show that by shifting the sheep about and giving them sufficient mild exercise (not chasing with dogs) the mortality can be almost immediately stopped.

MILKING-TUBES: ANOTHER EXPERIENCE.

THE following communication, received from a Westland correspondent, speaks for itself:—

I note in your September issue a letter from a Taranaki farmer regarding a certain rubber tube and silver siphon milking-machine which is now being introduced into New Zealand from Australia. It may interest the Taranaki farmer and others to know that I was asked to give this milker a trial last season. Considering its small cost when compared with other milking-machines, I realized that if it was a success there was a great future before it, and so I took up the trial with great enthusiasm. I paid very careful attention to the lengthy precautions advised by the agent for the milker, and followed all the printed advice and details most particularly—in short, I gave the milker the very best possible show on two cows which were good and regular and uniform in their milk. The result was a disaster for both cows, and after a trial of some months off and on (I had to discontinue the milker several times in order to let the cows get right again) I hung the milker up in the dairy, and every time I see it now I think how very nearly it ruined two good cows. After I gave up using this milker I became curious to know what experience others who had used it had had, and I wrote to five addresses of men who are supposed to be using this machine in various parts of Australia. I got these addresses from a booklet of testimonials sent with the milker. Though I enclosed stamped and addressed envelopes for a reply, it is a curious fact that not in one single instance did I get any reply. Again, I wrote to the agent explaining the various adverse results I had experienced from the trial, and he never troubled to reply at all.

ECONOMIES IN FARMING PRACTICE.

A. M. McTAGGART, M.S.A., Agriculturist, Fields Division.

THE economies in farming practice touched upon in the following notes are applicable to conditions in this country, and some of them already obtain here. It is claimed, however, that their adoption more or less generally, as governed by conditions, would be of all-round benefit. In treating various aspects of the subject a certain element of repetition with regard to previous *Journal* contributions by the writer has been unavoidable, but there are many factors in agriculture which continue to require the giving of periodic prominence. A definite sequence has been followed, so far as possible, in the presentment of the different factors in economy.

Land insufficiently drained is occasionally met with in process of treatment with lime and fertilizers. To the practical farmer this readily appeals as largely a waste of money and time; and this is the correct view to take, for land that is waterlogged or practically so will not make sufficient use of either lime or fertilizers. The land must first be treated from the physical standpoint before it can be treated from the chemical point of view. Fortunately, this error in farming, involving as it does wasteful expenditure, is not a prevalent one; but a practice that is somewhat akin to it is perhaps more common—the working of the land when too wet. Needless to state, this is a great mistake. Rather than work land when it is wet the farmer would be better employed seated within the house. The cultivation of wet land promotes a bad physical condition of the soil, the particles adhering together in great aggregates rather than in more or less single-grain structures, and these aggregates upon drying out promote a baked, clodded condition. On the other hand, the working of certain soils—refractory clay soils in particular—when slightly moist, facilitates the operation and promotes the desirable single-grain-structure condition.

The purchase and haulage of lime in form suited to the soil and situation is an important economic phase of the second essential factor in soil-treatment. Where there is a choice of using either burnt lime or carbonate of lime (ground limestone) for soils requiring lime, the latter form should be used in all cases, provided (1) that the price is not more than half to two-thirds the price of the burnt form, (2) that the freight is negligible and the haulage from the railway is not a big item, (3) that

the powder contains a fairly high percentage of lime-carbonate. Where the land requiring lime is situated much beyond the limit of 100 miles free railage (on 6-ton lots), or is located some distance from the railway or source of delivery, thus involving considerable haulage, the burnt form is to be preferred to the carbonate. The reason for this may be stated as follows: In 100 tons of carbonate of lime there are only 56 tons of calcium oxide (burnt lime), the other 44 tons being a gas (carbon dioxide), and the carbonate would occupy more space and would thus not be as concentrated as the burnt lime, which is the more suitable form for long haulage. Where, however, light soils obviously deficient in humus occur some distance from the railway or source of lime-supply, the burnt lime when chosen simply because of its concentrated form can be adapted (after haulage) for application to these light lands by air-slaking—*i.e.*, through exposure to the air by spreading out under the cover of open sheds for not less than six months. Such exposure causes the lime to revert to the carbonate form, in which form it is not exhaustive of humus, with which light soils are not as a rule plentifully supplied. The co-operative purchase of lime by more or less remote farmers is also an economy worthy of consideration.

The purchase of manures on the unit-value basis instead of by weight is an important phase of an important feature of farming operations. This new and approved system of manure-purchase involves the payment by the farmer to the vendor for each unit (1 per cent. carried through the ton, or 22·4 lb.) of nitrogen, phosphoric anhydride (P_2O_5), or potash a particular manure may contain on analysis.* This system is specially applicable to the purchase of manures other than the standard manures —superphosphate, dried blood, nitrate of soda, sulphate of ammonia, potash fertilizers, &c.; but even for these less variable fertilizers it is desirable, for the farmer is paying for the nitrogen, or the phosphoric acid, or the potash they contain, and these constituents are the manurial elements he requires for crop-production.

In certain other countries which have adopted this system the standard prices per unit for the three essential constituents are set by qualified State officials, standard analyses of the various manures, and average prices per ton at definite centres from time to time, determining these values. Were standard unit values of the three manurial constituents periodically set so that comparison therewith of the unit values calculated by the farmer

* The simplified method of calculating the cost per unit is as follows:—

$$\frac{\text{Cost per ton of manure}}{\%\ \text{nitrogen, or } P_2O_5\text{, or potash}} = \text{cost per unit, according}$$

to the class of manure being purchased.

could be made, the system could be instituted here, to the decided advantage of all concerned. Meantime, however, it is not universally applicable. The matter is merely introduced here in order to indicate a further important line along which agricultural economy may be effected. Of course, the stamping on the bag of the guaranteed minimum analysis and the forms in which the three constituents exist is of decided advantage to the purchaser of manures, but the "unit basis" method of purchase in addition is decidedly equitable to both farmer and manure-vendor.

The co-operative purchase, by more or less remote farmers, of manures is also an economic factor of some importance to agriculture.

The application of manures, mixed by the farmer himself after instruction, suited to the conditions of soil, crop, and climate (only after the soil has been first treated from the physical standpoint), is another important factor in the agricultural economics associated with this country. Through the use in many cases of manures that are obviously unsuited to the soil, crop, and climate many farmers lose considerably, or produce much less from their land than they would otherwise. It is true that in many instances manure-vendors send out satisfactory manurial mixtures for particular crops, but as the soil and climate of this country vary very much, even within a not very extensive area of country, these mixtures, while well suited for definite conditions, frequently do not fully suit the varying conditions obtaining throughout a given stretch of territory. Then, again, the farmer is often found using for a particular crop a standard single fertilizer that, from an examination of the soil and a knowledge of the climate—particularly the rainfall—of the locality, the trained man can readily see is entirely unsuitable for the crop in question. The need for more knowledge of the application of fertilizers, from the point of view of crop, soil, and climate, on the part of many of our farmers is, indeed, most apparent.

The free use of manures during times of high prices for produce, and the small or moderate use of such during periods of low prices, involves an economic factor of some importance. At any time, in a country of plenteous rainfall more especially, there is loss of manurial constituents from the soil, particularly of nitrogen, hence the economy in reducing the quantities of manures used in times of low prices of produce. The losses are reduced to a minimum, and satisfactory production is maintained mainly on the natural fertility of the soil. On the other hand, high prices justify costly methods, manurial or otherwise, being employed in pushing production.

On the (comparatively few) farms where farmyard manure is produced in quantity this material should as far as possible be

stored, heaped up over a firm clay ground basin, under a roof of some kind, and not thrown out and so exposed to the weather. Considerable losses take place by the washing-out by rain of the soluble constituents of the decaying manure, and by the evolution into the air of nitrogen in the form of ammonia. The heaping-up of the manure, together where possible with periodic pumping over the heap of the liquid (the most valuable portion of farm-yard manure) that has been carefully collected in a cemented receptacle excavated for the purpose, materially reduces (through excluding the air as far as possible) the formation by bacteria of ammonia, and hence minimizes its evolution into the atmosphere.

In bush districts the preserving, under cover, of wood-ashes and utilizing these as a source of potash and lime is also an economy that is worthy of consideration, especially in these days of potash scarcity. Moistened somewhat before use, these ashes can be rendered serviceable for applying to soils, particularly those of the light order that are not usually too well supplied with potash. The potash produced also from the periodic burning of hedge-cuttings should be distributed as far as possible over the land. These cuttings the young shoots of which, as shown by chemistry, are particularly well supplied with potash, instead of being burnt at the same distance from the hedge each time, should be consumed over a gradually extending area, within definite limits.

On most farms in New Zealand are to be found bones of farm-animals, particularly sheep. Where these can be conveniently gathered they may be broken down by being placed in roofed watertight bins and enveloped with well-moistened wood-ashes or earth that has been thoroughly saturated with liquid manure. After remaining in the bins for some time the bones can be readily broken up and utilized on the land as manure.

On soils that are somewhat deficient in humus, as indicated usually by the absence of good dark colour to a reasonable depth from the surface, also by the "floury" texture of the soil, economy is decidedly exercised by utilizing stubble lands for growing crops for ploughing under later. Such crops as white mustard, crimson clover, or rape can be grown on them by simply disking the soil, tine-harrowing, broadcasting the seed, and covering with tripod or chain harrows. Within a few weeks an appreciable growth is obtained, and if not required for feed or stock not available the crop can be turned under. There is no loss of season involved, for stubble land that would otherwise lie idle to a large extent is utilized, and the land is quickly and appreciably supplied with what it lacks—humus. We have on record many striking instances of the effect of ploughing-under a green crop,

particularly a legume, in soils deficient in humus. An outstanding example is the strikingly increased growth of a non-leguminous crop that takes place in a sandy soil after the ploughing-under of a leguminous crop (lupins, &c.).

In districts of more or less plenteous rainfall the keeping of the soil on exposed positions and porous open soils as far as possible covered the year round with a crop of some kind, grass or otherwise, makes for economy of soil-fertility. Over the greater portion of the country nitrates are being formed all the time, and the growth maintained takes up these nitrates, and thereby prevents them to a large extent from being leached from the soil.

The practice of thorough and timely cultivation, consistent with the availability of labour and other conditions, involves elements of economy that are most important, particularly in districts of non-plenteous rainfall. The conservation of moisture, the checking of weed-growth, and in general the promotion of better growth of crops are the principal objects of cultivation. During a prolonged dry spell surprising effects are sometimes produced by a single harrowing of a young crop of wheat, maize, or turnips. The harrowing promotes the formation of a "dust mulch" on the ground surface, thereby checking evaporation, and so conserving moisture for use by the crop. Thorough and timely cultivation also makes for economy in that it materially assists in making the full use of manures, which cost money to the farmer.

There are many economies in connection with the selection, use, and care of implements on a farm. The suitability as regards weight and draught to the class of land, to the size of fields or farm, and to the power available, and as regards effective cultivation for the class of land and the system of farming, is a determining factor in the choice of cultural implements particularly. In the realm of farm machinery generally there are many improvements that make for economy in production, including that most important factor, labour, and in the effective utilization of staple farm crops.

There is also the important factor of employing implements—and employing them effectively—that are suited to the climate. Implements that are designed to some extent for use in the preparing of the land so that moisture will be conserved, in districts where such conservation is highly desirable, are specially recommended. In an article on cultivation, by the writer, published in the *Journal* for January last, a plea was made for more adaptive methods in connection with the arable farming of this country. It was claimed that there should be employed implements and methods that are suited to the varying conditions of climate and soil of New Zealand.

Finally, economy as regards the implement phase of farming can be effected in the proper housing and care of implements when not in use. The life of an implement is not only prolonged but valuable time is assuredly saved where such provision is made.

The adoption of a proper rotation of crops on the farm is decidedly in the interests of economy. This is effected by economizing in the manure to be applied to each successive crop, by conserving the fertility of the soil generally, by promoting ease in the working of the soil, by causing the systematic destruction of weeds, by tending to evenly distribute labour, and by increasing the production from the farm generally.

In the domain of cereal-growing economy can undoubtedly be effected by treating grain with formalin, for smut; by sowing clean seed of good sample; by sowing oats early in districts where rust is prevalent; by cutting wheat and oats when not dead-ripe, thereby preventing loss by wind; and by building good stacks with the hearts or centres well kept up and thatching them when intended to be kept for some time.

Economy is certainly brought about by the provision of a continuous supply of green feed, for soiling (cutting as required), or for pasturing during periods of scant pasture in winter and during a dry summer period, especially on land that is not prone to sustain a full pasture throughout the year. These supplemental pasture crops are invaluable to the farmer during periods of shortage.

The growing of lucerne where possible, especially by the dairy-farmer, is decidedly in the interests of agricultural economy, in that the crop provides on a comparatively small area such a prolific perennial growth of fodder rich in protein—a potent flesh- and milk-forming constituent of plants. When established, also, lucerne thrives under conditions of moisture and soil-disadvantage unapproachable by other farm crops. The cleaning and cultivation of the crop by proper implements, thereby maintaining a continuously thrifty condition, is a further factor that may be regarded in the light of economy.

The purchase of none but clean seeds of strong vitality embraces an economy the neglect of which is far-reaching in its effects, as is exemplified in the adage "One year's seeding, seven years' weeding." Cheap unclean seed is dear at the lowest price.

In dairying districts particularly, the co-operative growing, on smallish areas set aside for the purpose, of seeds of more or less expensive forage and green-manuring crops embraces an economy of some importance. The farmers co-operating could supply themselves with seed and sell to advantage any surplus.

In the production of hay the cutting of grass when not too far advanced involves economy as regards the digestibility, hence productiveness, of this valuable form of fodder. When grass intended for hay is allowed to go too far the resulting hay is too "woody," and so is reduced in palatability and to some extent in digestibility. So also in the production of lucerne hay the crop should be cut when one-tenth to one-third in bloom, thereby providing a sample of hay of the most palatable and digestible order. In the making of lucerne hay good weather should if possible be hit upon, and the hay handled only sufficiently to promote satisfactory curing. In so doing the leaves are preserved as much as possible, for it is in them that the highest percentage of protein exists.

Where feed is in abundance and much of it is in danger of being wasted (from the point of view of the production of animal products) by being trampled under foot, quantities of this surplus growth can readily be made into ensilage, in stack or silo, and preserved for periods of scarcity; and there are few districts in New Zealand that have not at some time or other experienced such periods and that could not profitably adopt this system of economy even on a modified scale.

Economy in feeding can be brought about by balancing rations under natural conditions — by bringing together in definite ratio, naturally or artificially, for the most effective feeding forage crops rich in protein on the one hand, and those rich in carbohydrates (starches and sugars) on the other. Examples of such balancing, more or less, are oats and peas sown together, rye and vetches, Italian rye and cow-grass, pasture grasses well accompanied with clovers, maize, and lucerne in the form of ensilage, &c.

Where by-products on the farm would otherwise go to waste, the keeping of various classes of farm-animals that would utilize these is evidently economical. Such by-products and their means of utilization are well enough known to the farmer and need not be further referred to here.

Economy is effected by harrowing the pasture in the early spring particularly with tripod harrows or tine harrows inverted, in order to break the crust of soil formed as the result of the winter rains, to drag out moss, and to scatter animal droppings, which, if left undisturbed, encourage (by concentration of nitrogen) the coarser grasses to the detriment of the finer grasses and clovers.

In dairying districts especially the adoption of a system of rotation of pastures is decidedly economical in that it tends to evenly distribute the exhaustion of mineral constituents (lime, phosphoric acid, and to some extent potash) of the soil that takes place as the result of the continuous export of milk-products and, in many instances, of young growing animals. The continuous grazing of

particular areas by milk-producing and young bone-producing animals tends toward comparatively rapid exhaustion of the mineral wealth of soils.

Certain hill country that cannot be top-dressed with manures can in portion be improved appreciably by periodic *crowding* on it for comparatively short periods of mature sheep and cattle. This system, periodically carried out, is materially assisted by the growing on handy rich flats of forage crops on to which the stock can be transferred after grazing on the hills, and by spelling the latter subsequently.

Following the methods used in obtaining the fully tested results of local experience in preference to the methods adopted in other districts may be recommended, in conclusion, as a sound principle making for economy. Such methods should only be adopted, however, if they have been tested during many years, and so have persisted because of their advantages. The practices of certain other districts may or may not suit the conditions of the district concerned; hence the wisdom — on the part of the new farmer particularly—of adopting the local methods that have stood the test of time. Obvious minor improvements, embracing the results of recent discovery or demonstration, could, of course, also be adopted to advantage.

SHEEP ON PUMPKINS.

Mr. A. J. Faulkner, of Wairakaia, Gisborne, sends the following supplementary note to his account of pumpkin-growing for sheep, published in last month's *Journal*:—

"The point may be raised as to the effect of pumpkin-feeding on the condition of the sheep. Close feeding of sheep (especially hoggets) in such a large mob on a small acreage makes fattening on any crop hard. I find in putting hoggets in healthy condition on pumpkins that they do not fatten, but if a farmer knows his business they do not go back in condition. Their dung gets yellow and hard like that of a stall-fed horse; the one day's change in five on to grass keeps their bowels in order; and when put on to the clean feed on the hills the way they improve in condition and growth of wool is simply marvellous. I have watched for several years to find if the close feeding on pumpkins would cause a break in the wool, but so far have not found this the case."

It will be recalled that Mr. Faulkner's sheep when on pumpkins also have access to hay.

SCIENTIFIC NATIONAL FORESTRY FOR NEW ZEALAND.

Concluded.

D. E. HUTCHINS, F.R.G.S.

COMPARATIVE VALUE OF FOREST PLANTATIONS AND NATIVE FORESTS.

THE area of the New Zealand Government forest plantations, reckoned up to 31st March, 1916, is 27,217 acres. The plantations have cost £361,097, or an average rate of £13 5s. 4d. per acre.

With the plantations as they are (little *insignis* pine, no great area of eucalypts, and a large area of larch, *ponderosa*, and *Laricio* pines, together with set-backs from fires and the repairing of mistakes) I do not think we can assume a higher average yearly timber-yield than 100 cubic feet per acre. This is somewhat more than the yield figure suggested in the last yearly forest report of the Lands Department, page 3. Better forestry presently, we hope, will double this figure; but as an average figure for that which is planted I scarcely think it will be safe to go higher than 80 cub. ft., or at the most 100 cub. ft. (= 1,200 ft. sup.). This point is discussed in my report on New Zealand forestry now under preparation. It would not affect the main issue if one took the yield at 120 or even 150 cub. ft. per acre per year (Acrim).

In 1906 a timber-mill census of New Zealand conducted by the Lands Department gave the total mill-output as 432,000,000 ft. sup. There was in 1913 an excess of timber exports over imports amounting to a little over 13,000,000 ft. sup., so that according to the timber-census figures of 1906 the net yearly consumption of timber in New Zealand is about 419,000,000 ft. sup. In the last annual forest report the Lands Department estimates the yearly New Zealand consumption of timber at 360,000,000 ft. sup. (= 30,000,000 cub. ft.) per year. The Forest Commission of 1913 adopted the same figures. To make the best of a bad case I will take the lower figure.

With an average yearly yield per acre of 100 cub. ft. (1,200 ft. sup.) the yearly production of timber in the New Zealand plantations is thus 27,217 acres × 100 yield = 2,721,700 cub. ft.—say, 2¾ million cubic feet, or 32,780,400 ft. sup. So that in their present state the plantations are producing equal to one-eleventh of the yearly consumption of timber in New Zealand; or, in other words, to produce

a yearly growth of timber equal to the present yearly consumption of timber in New Zealand eleven times the present total plantation expenditure would be required. The present plantations have cost to date £361,097. Eleven times that figure is £3,972,067. Therefore, in round numbers, four millions' worth of the present class of planting would be required to provide for the yearly consumption of timber in New Zealand at the present rate.

This, however, is not the whole of the story. It will take an average of at least forty years for the plantation timber to mature, so that, allowing compound interest at 4 per cent. for forty years, the four millions become £19,200,000. After forty years it would be uncertain whether the £19,200,000 expenditure would have to be repeated, or whether, as in the native forest, natural regeneration could be depended upon. I put forward these figures not as showing that forest-planting is impossible in New Zealand, but to indicate what happens when attempting to carry out the crude idea of the "man in the street" that forestry consists in cutting down one tree and planting another.

As a rule the forester looks on planting as a last resort, and in New Zealand, with labour as high as it is, he may come to regard it as a surgical operation—only to be resorted to when every attempt to get natural regeneration has failed. A little reflection will show that this must be so. Every tree selected by the forester for felling rejuvenates the forest and brings in revenue; every tree planted costs something, and that something goes on piling up compound interest at 4 per cent. for a term of years till the tree is ripe for cutting. To destroy the existing forests of New Zealand and replace them entirely by plantations — looking on the matter purely as one of pounds shillings and pence—would cost New Zealand something between nineteen millions sterling and nineteen millions plus the cost of regeneration at the end of some forty years. And this, as we have seen, is to provide only for the needs in timber of the present small population. The nineteen millions does nothing to meet the loss of the natural export trade in softwoods to Australia, or the serious injury to such New Zealand industries as might be expected to develop with increasing population and national forestry, such as furniture and paper making, tanneries, &c.

The question of plantations *versus* natural forest was stated judicially by the late Inspector-General of Forests, India (the highest forest official in the British Empire), when he visited Victoria and reported on its forestry to the Victorian Government. He said, "Planting on a large scale is costly, and it will be found, if an accurate ledger is kept of the original outlay and all its incidental expenses, that artificial-forest cultivation will repay the money and

time spent on it only under very exceptional circumstances." A calculation is given in my Australian forest report showing that if the area of the forest reserves in Victoria and New South Wales (small enough areas too) were to be cut down and replanted, the cost, with compound interest for eighty years at 4 per cent., would amount to the enormous sum of £3,105,000,000. This is the sort of venture that New Zealand has embarked upon in proposing to destroy its native forests and replace them by plantations.

FOREST FINANCE IN NEW ZEALAND.

The gross expenditure on forestry in New Zealand from 1896, when the plantations were begun, must now be upwards of half a million sterling. As previously stated, the Government plantations have cost up to last March £361,097, and it is probable that quite one-third of this expenditure has been ineffective owing to the absence of skilled direction. Besides the Government direct plantation expenditure, about £88,000 has been spent on scenic reserves, together with an unknown sum on the railway plantations, Selwyn Board plantations, and private plantations on the Canterbury Plains, &c. It is true that the last two items are local-government and private expenditure, but they, equally with the national expenditure, have suffered from the absence of the ordinary scientific forestry of other countries. Is there another instance anywhere of a country spending such a sum on a highly technical subject without technical advice? Such a procedure runs counter to all modern practice, which tends more and more towards specialization in each subject.

The yearly expenditure on forestry is now over £40,000. For 1915–16 the official returns show a forest expenditure of £30,318 on the Government plantations, and an expenditure of £7,878 on the scenic reserves, a total of £38,205. If we include the pay of officials of the Lands Department who are doing forest work, it is evident that the present forest expenditure of New Zealand must be well over £40,000 per year. There is also a certain part of the expenditure of the Tourist Department which would come into the forest department in other countries.

For its annual forestry expenditure of over £40,000 all the practical forestry that New Zealand gets is a yearly additional planting of two or three thousand acres to a totally insufficient present area of 27,217 acres of forest plantations, and some inspection of the scenic reserve forests—for there is virtually no fencing, systematic fire-protection, or other practical work to protect the forests in general. Beyond collecting a slender forest revenue practically nothing is done for the natural forests of the country.

South Africa has just three times the New Zealand forestry expenditure, for which it gets a completely equipped Forest Department, a sound system of forestry, and some 18,000 acres of forest planting yearly, or over six times the yearly planting of New Zealand. The total area of the Government forest plantations in South Africa is about two-thirds larger than that of the New Zealand plantations. In 1883 there was only a nominal Forest Department in South Africa and a nominal forest revenue.

For the sixteen years previous to the outbreak of war there was in New Zealand a total forest revenue of £609,378 (Lands Department pamphlet, 1914). During recent years the forest revenue has varied between £30,000 and £60,000 a year. For the year before the war broke out it was £29,771. Of the total forest revenue since 1898–99, about half has been expended on the forest plantations. A considerable portion of the forest revenue, over £100,000 (Lands Department pamphlet, 1914, p. 20), has been paid to local bodies for the upkeep of their roads. In a large sense we must look on this merely as defective book-keeping. The whole forest revenue and a considerable forest loan should have been expended in putting the forests in order. The delay in spending the second half of the forest expenditure when it was so urgently required to put the forest estates into order will cause an eventual loss that it is impossible to calculate or even roughly estimate.

New Zealand at present, cutting about twenty-five times the quantity of timber that South Africa does, has a forest revenue amounting to only about half that of South Africa, which is £57,000 (1912–13). It is a repetition of the Australian experience of a nominal Forest Department and a nominal forest revenue, or a real Forest Department and a real forest revenue. In Australia, whenever an effective Forest Department has been established it has paid for itself many times over within a few years. In Victoria the forest revenue rose from £17,000 to close on £70,000 in ten years. The forest revenue of New South Wales rose from £10,000 in 1901 to £95,000 in eleven years. And these Forest Departments are not yet fully equipped and organized as in Europe and South Africa.

It is fairly certain that an effective Forest Department in New Zealand would double or treble the forest revenue in a few years, or, even as in New South Wales, increase the revenue tenfold. One hears on every side stories of waste in the forest. It has been stated on good authority that as much kauri has been burnt or spoilt by fire as has passed through the sawmills. I have already mentioned that the kauri timber burnt and partially wasted in one forest, the Puhipuhi, has been valued at three millions sterling.

RIMU AND WHITE-PINE FOREST, GREAT SOUTH ROAD, WESTLAND.

Nearest rimu on right 5 ft. diameter by 168 ft. total height. First white-pine on left (near telegraph-pole) 4 ft. diameter by 184 ft. total height.

[*Photo by D. E. Hutchins.*

In spite of a forest expenditure which, though small, is too large to waste, and a certain forest revenue, the first steps have not yet been taken in ordinary forestry organization in New Zealand. Forest demarcation, which was almost finished in Victoria three years ago, has not yet been started in New Zealand. New South Wales expects to finish the bulk of its forest demarcations this year. South Australia demarcated its forest reserves many years ago. Not only has New Zealand not begun its forest demarcation,* but it has not yet framed a forest Act worthy of the name. Even the weak State Forest Act (No. 184 of 1908) remains a dead-letter. Of State forests in the ordinary sense of the word not an acre has yet been constituted. The forest school contemplated in the Forest Act remains on paper only. There is not in New Zealand a trained forester in the European or American sense.

FOREST EMPLOYMENT.

Nothing, I may repeat, has yet been done in New Zealand to develop with forests and small farms the mountain lands as in the Vosges Mountains and Black Forest areas. As mentioned, these mountain-forest areas in Europe are, many of them, giving an average net return of £2 10s. an acre. This, it must be remembered, is the mean net yearly yield of the forest over the whole area, not the yield from an acre of forest at the end of eighty or ninety years. It is more than the returns of ordinary grazing-farms; it may exceed the net yield from many cultivated lands. These valuable European mountain forests go with small farms in the valleys and the opening-up of the country with good mountain-roads.

Land so developed gives much employment. The average employment in the forests of Bavaria is one man per 130 acres of forest. The employment afforded in other cultivated European forests is discussed in my recent report on Australian forestry. Besides the employment in the forest there is the employment in working up the forest-produce. In these European forest valleys are timber and pulp mills giving employment to a large industrial population. Statistics show over seven hundred pulp-mills in Germany; in England two only, and these fed by imported timber! The pulp-trees are spruce, silver-fir, and poplar, all three growing well in New Zealand almost wherever they have been planted, and spreading naturally in the native forests when once introduced and cared-for by foresters.

The introduction of systematic forestry now would be opportune. There is certain to be much demand for employment after the war,

* Preliminary action for the demarcation of the Waipoua Forest has now been taken.

if not sooner. In South Africa, after the Boer War, the Government had to find work for a large number of white men left stranded with the cessation of war conditions and the large special expenditure. The unemployed were found work partly on railway-construction and partly on forestry. Even for the weaklings and alcoholics light work was found in the timber plantations—thinning, bark-stripping, weeding nurseries, &c.

For forest-development in New Zealand there is work of an extensive character, and in the country away from town temptations. For the able-bodied, roadmaking, ring-barking for natural regeneration, the formation of grassed fire-lines, the putting-up of rough buildings at "forest stations," the preparation of strips of land for the introduction of choice self-spreading exotic timbers. For the maimed there is light work in the forest nurseries, and for those still strong on their legs employment as rangers, foresters, and forest-demarcation assistants.

FOREST DEMARCATION.

It is preferable that forest demarcation should be done by the Forest Department, since it is mainly an estimate of the timber-growing capability of land. Following the practice of other countries, there should be a survey branch of the Forest Department, occupied at first with forest demarcations and then with forest "working-plans." In this way the knowledge of the forest gained in the first work is useful for the second. Both demarcation and working-plans are necessary before a wild forest can be brought under systematic treatment. The want of working-plans, however, need not stay development-work after the war, or as soon as work is wanted for returned soldiers or State pensioners; but forest demarcation is urgent, and cannot be delayed. One cannot start developing a forest without boundaries.

Whenever forest demarcation is contentious—and there is always at certain places a conflict between local and national interests—the disputed demarcation-lines should be settled by the highest independent authority available. In demarcating the eastern forest districts of Cape Colony there was a sharp conflict over native rights. The Assistant Surveyor-General was then sent up from Cape Town to act as arbitrator. That was thirty-three years ago, and the demarcation-lines have stood unquestioned since. In 1911, in British East Africa, there was again contentious matter over native rights. The Deputy Governor of the colony then came out into camp, and mile by mile (acre by acre in some places) settled the final demarcation-lines. Here the forest was on the highlands and similar to that of South Africa and New Zealand.

Australian forestry has long since been looked upon as the worst in the civilized world. Compared to its size, Australia never had any large area of good forest, and owing to the want of forest demarcation the greater portion of that has been destroyed with the larger area of worthless forest. A calculation in my "Australian Forestry" gives official figures showing that the loss to that country from the present bad forestry at the end of thirty years will amount, with interest at 4 per cent., to somewhere near £588,000,000. Thirty years is taken because that would be the least time within which the forests might be got into working-order. Australia is paying three millions and a half yearly for imported timber now, and five millions is the estimate for a few years ahead. "Demarcate, demarcate," said every Indian forester who visited Australia in the "seventies" and "eighties," but the advice fell on deaf ears. The penalty is now being paid.

Nevertheless, Australia has at last made considerable advance in forest demarcation. In Victoria 4,000,000 acres have now been definitely demarcated and set aside as the national forests. New South Wales expects to have 5,000,000 acres similarly demarcated at the end of this year. South Australia, besides demarcation, has a good forest-redemption Act, and is gradually buying back areas that were lost owing to want of forest demarcation in the bad old days of no forestry. Queensland and West Australia have at the head of their forest administrations fully trained and qualified professional foresters, and naturally they are doing all that is possible to forward forest demarcation in their States. It is only Tasmania that is like New Zealand in not yet having begun forest demarcation.

The example of reckless forest alienation and destruction in North America has doubtless had an unfortunate influence on the forest policy of New Zealand. But the United States of America began forest demarcation on a large scale in the early days of President Roosevelt's administration, and now thinks it has reached the limit of its forest destruction with eleven thirty-eighths, or nearly one-third, of its total area still under forest (Professors Moon and Brown in "Elements of Forestry, 1915"). Of its total forest area 21 per cent. is "national forest" under the management of the Forest Department. It is thus clear that in spite of all the reckless destruction of forest that has taken place the United States to-day is in a far better position than New Zealand. The United States has been buying back one forest area, the Southern Appalachians, at a cost of about half a million sterling yearly. This is the penalty, in one locality only, for having had no forest demarcation in the past.

Japan, so similar in many respects to New Zealand, has given the forestry question a most careful consideration, sending missions abroad to study forest management, and then spending a quarter of a million sterling yearly (somewhere near one million at New Zealand rates of labour) to organize its national forests. Its forest demarcation was accomplished within a few years of its becoming a civilized Power.

In India forest demarcation was a big business that required some ten or twelve years to accomplish. As in all countries with national forests, small adjustments of boundaries are still taking place. I had to do with Indian forest demarcations between 1872 and 1880.

As soon as I arrived in South Africa I was sent out to demarcate forest in British Kaffraria, a beautiful mountainous country of rolling grassy downs and broken forest closely resembling that of New Zealand. Here I pitched my camp and spent a year or two demarcating the forest, which was being steadily destroyed by the Kaffirs on one side and white colonists on the other. The demarcation pulled up the forest-destroyers with a sharp turn. As soon as they got on the wrong side of a demarcation-line with axe, cattle, or fires there was a visit from the local forester and an appearance in the Magistrate's Court. The story is told in my recent report on forestry to the West Australian Government, together with other details regarding forest demarcation generally.

In our newest colony, British East Africa, as soon as the *pax Britannica* was established a qualified forest officer was obtained from India and the forests demarcated. Then, after a few years, came the rush of white settlers, and I was sent up from South Africa during the years 1907 to 1911 to put in a more detailed and final demarcation.

AREA OF DEMARCATED FOREST REQUIRED FOR NEW ZEALAND.

New Zealand should obviously be a self-contained country in forestry. The one neighbouring country, Australia, can only supply hardwoods, and nine-tenths of the world's use of timber is soft-wood. In Europe the countries, such as Spain, Portugal, Italy, and Greece, that, owing to misgovernment, lost their national forests have now to pay a heavy toll to other countries for imported timber. England before the war was paying £43,000,000 yearly for imported timber. There are other countries, again, which have an excess of forest, and, lastly, countries which are self-contained and able to supply their own wants with perhaps some little excess or want of timber. France, Austria, Switzerland, and most of the German States are in this class.

It is these last countries that are useful to take as guides for a new country, such as New Zealand, demarcating its forests. And here

we see that on an area basis it is found economical to have about one-fourth of the area under forest, and on a population basis roughly 1 acre per head. The latter is a rough approximation, since much depends on the quality of the forest and the civilization of the country. The general rule holds that the more civilized and populous the country the greater is the use, *per capita*, of timber and the better the forestry and quality of the forest. The proportion of forest prevailing along the Rhine and in the best part of central Europe is well seen in the large-scale war map now obtainable at the booksellers' shops in New Zealand. Forbes, in his interesting study of European forestry, works out an average of 1 acre of good forest per inhabitant.

On a population basis and an average of 1 acre of good forest per head, New Zealand for a population of twenty millions would require 20,000,000 acres of demarcated forest; and it is impossible to anticipate a population of much less than twenty millions within the next hundred years for a country so richly endowed as New Zealand. It will be remembered that forestry has to look forward at least a hundred years, and that any excess of timber in New Zealand can be profitably sent to Australia, where certainly for the next hundred years the present very large demand for softwoods will continue. Australia to-day is importing yearly three and a half millions' sterling worth of softwoods, of which New Zealand only supplies half a million's worth.

If we consider the European standard from an area point of view, New Zealand would require 25 per cent. of its area under forest, or a demarcated area of 17,000,000 acres. Thus, economically, and on the standard of the most advanced States of Continental Europe, New Zealand should have something between 17,000,000 and 20,000,000 acres of demarcated forest. The European standard forest area, it must be remembered, is the outcome of centuries of trial and conflicting interests; and the result is that one-fourth of the area under forest is the proportion found most useful in the best populated and most industrial parts.

FOREST REDEMPTION AND DEVELOPMENT.

In view of the comparatively small area of native forest now left to New Zealand, demarcation will naturally have to be carried out in the most liberal sense towards the forest areas, and it should be accompanied by the buying-back of alienated forest land whenever prices will allow of this being done. Special legislation would be required, and there might be a redemption fund for this purpose, as in Victoria and in South Australia. The French forest budget contains yearly an item of 1,000,000 francs (£40,000) for forest re-

demption. The Conservator of Forests, Queensland (a trained forestry University graduate), considers, I believe, that forest redemption there is generally preferable to forest plantations. This is doubtless equally true in New Zealand.

WHITE-PINE NEAR FERGUSON'S, WESTLAND.

The tree marked x is the tallest tree measured in New Zealand. It has a total height of 210 ft. and is about 4 ft. in diameter at 5 ft. above ground-level. [*Photo by D. E. Hutchins.*

It may be asked how forest-development is to be paid for. The answer is, with the money going out of the country for imported timber (soon to be doubled or trebled with the failure of the forest and increase of population); with the employment that goes with

work in the cultivated forest; with the cheap raw material for the house-building, furniture, carpentering, tanning, and paper trades; and with some certain reduction in the cost of living.

There must naturally be a forest loan to develop and improve the forest. Such a loan, leaving out all indirect advantages, would certainly yield a return above that of railways or most other public works. Japan spent many years developing and organizing its forests, and the money was mostly obtained by the sale of surplus forest land. New Zealand has taken this money for other purposes, so that a loan now is required to restore the balance.

ARBORICULTURE FOR FARMERS.

Not very much can be done at present for farmers by the State in New Zealand with only four forest nurseries, no seed-store, only the beginnings of a Forest Department, and no general system of forestry throughout the Dominion as in other countries. Nevertheless, a good beginning has been made, and the Lands Department's Forestry Branch is doing its best under the circumstances. There is an undeveloped mine of wealth in arboriculture for farmers in New Zealand. In these latitudes in Europe the trees of the field (not forest or orchard trees) often yield as much as the crops or grass on the ground.

In South Africa arboriculture for farmers and national forestry have gone hand-in-hand for the last thirty-three years, each helping the other. There are 143 Government forest nurseries, large and small, all of which issue trees to farmers; and there is a Government seed-store issuing authentic tree-seed. The operations of the store, too, are purely in seed from the Government plantations, or rare forest seed from abroad; so that it does not interfere with the ordinary nurseryman and seedsman's business. In fact, nurserymen buy seed from it for retail. In the year 1912–13 59,000 lb. of seed was sold to the public at an average price of 11d. per pound. The last year before the war there was issued to the public five and a quarter million young trees valued at £14,000, an average price, say, of 5s. per hundred. It is perhaps a mistake that prices have been raised recently. Any one may purchase trees from any forest nursery, even from the small temporary nurseries in the "bush." Near the capital, at Pretoria, is a large forest nursery maintained solely for the requirements of the public. The issue of plants and seeds from the nurseries and store is on the principle of cost price, without any restrictions or regulations. The prices include delivery to the nearest railway station or siding. The Railway Department water the young plants if they show signs of wanting it. There is a good "Tree-planting for Farmers" pamphlet.

South Australia has been distributing young trees to farmers for the last thirty-three years (as long, in fact, as South Africa), and has spent over £55,000 in doing this good work.

It is somewhat doubtful whether the present State nurseries in New Zealand (nurseries of British character in the latitude of Spain), good though they are, are the best for the country. The percentage of failures shown in the Government planting returns is not large; but, on the other hand, one hears of a good many trees sent to farmers of which the planting has failed in careful and experienced hands. It has been asked why the common silver-fir of Europe is absent from the Government plantations. It has failed, I am told; but it has succeeded in Mr. T. W. Adams's more difficult Canterbury planting, both as regards growth and natural regeneration. There are statements from private planters that the young open-root trees from the Government nurseries will never give the best results. It must be remembered that the New Zealand climate has temperatures running with those of France, but the sun is the sun of Spain and Italy. Wellington, Rome, and Madrid are practically in the same latitude — actually the latitude on the world's surface where, at midsummer, occurs the mathematical "maximum of insolation." Go Polewards, the sun loses in power; go Equatorwards, the days become shorter. Thus it happens that tree-planting in New Zealand has to face trying days in quite early spring before the young trees have become established, and there are no "pot-and-pan" plants for doing this. In South Africa, where tree-planting is more difficult than in New Zealand, nearly all the young trees, whether for Government or for private work, are rooted and sent out in tins gathered from the rubbish-heaps, or in old kerosene-tins collected for the purpose.

CONSERVATIVE LUMBERING.

It is necessary here to say a word as to what is meant by the forestry that cuts the timber and conserves the forest, and I cannot do better than quote the words of Gifford Pinchot, the "father of American forestry," as he has been termed by a well-known French forester:—

The products of the forest are among the things which civilized men cannot do without. Wood is needed for building, for fuel, for paper-pulp, and for unnumbered other uses, and trees must be cut down to supply it. It would be both useless and mistaken to try to stop the cutting of timber, for it could not cease without great injury not to the lumbermen (millers) only, but to all the people of the nation. The question is not of saving the trees, for every tree must inevitably die, but of saving the forest by conservative ways of cutting the trees. If the forest is to be preserved, the timber crop now ripe must be gathered in such a way as to make sure of other crops hereafter. . . . It will

be easier to do so when the methods and advantages of *conservative lumbering*, which is *forestry*, are better known to the American lumbermen, and are therefore in more general use. . . . German methods would be as much out of place in America as American methods in Germany. What American foresters should do and are doing is to combine the general principles of forestry, which are true all the world over, with American methods of lumbering. ("A Primer of Forestry," Government Printing Office, Washington, 1909.)

This was written seven years ago. Since then forestry has advanced steadily and rapidly in the United States of America. Its recent developments are well known.

Forty years ago beekeepers destroyed the bees to get the honey; then came modern beekeeping, in which the beekeeper gets his honey and preserves his bees. It is the same story with modern forestry; the forester gets the timber and preserves the forest.

A little reflection will show how easily that can be done—when you know how. In nature the old tree gradually decays, falls, and its place is taken by young trees around (the "advance growth" of foresters), or by the germination of dormant seed in the ground when light is let into the forest by the fall of the old tree. Suppose man comes and cuts the old tree before it goes to decay, there are the same young trees around or dormant seed in the forest to take its place. The more of the older trees that can be cut at one time without unduly interfering with the reproduction of the forest the better for the mill, for the forest, and for the work of the Forest Department. Just how far one can go in the cutting-down the forester has to find out, and to arrange his working-plans accordingly. That may be said to be the chief object of his life's work: it takes long study.

In New Zealand forests there will be *jardinage* or "selection" fellings in climatic or exposed areas, and a twenty- to forty-years rotation cutting, as in the Cape Colony forests, in more accessible areas, under more intensive working. A forty-years rotation would probably be getting on to thin ice in a New Zealand forest. The clean-cutting of Australian forest management would be disastrous in a New Zealand forest.

FORESTRY AND GRAZING.

When forestry and pasture occupy the same class of ground the employment—comparing average pasture and average forest in England—is about one man pasture to fifteen men forest. In New Zealand, where the forest-growth is more rapid and the sheep look more after themselves, the comparison is still more in favour of the forest. Said the Report of the Departmental Committee on Forestry in

Scotland (December, 1911), "Forests of the same size give ten times as much employment as sheep-farms, without reckoning the population absorbed in attendant industries, which might in many cases treble that figure." Said the General Federation of Trades-unions, Great Britain, 1911, in urging the adoption of State forestry to add to the productiveness and population of rural districts, "Sheep-farming employs only one man per 1,000 acres." The (British) Coast Erosion Parliamentary Committee quoted one man per 1,500 acres as a general average for sheep, and one man per 100 acres for forest, including planting.

With the high cost of labour in New Zealand, and planting only here and there in the native forests, one may perhaps average the employment at about one man per 300 acres for accessible well-developed forests.

Putting aside the question of relative employment, it is probable that in New Zealand even the actual amount of pasture would be greater in well-developed mountain forest than on poor mountain grassed lands when these have got into a leached-out condition and become invaded by noxious weeds. Forest, it must never be forgotten, tends perpetually to conserve the fertility of the soil, so that there is good grass in every opening of the forest.

When I compare the broad grassy drives and paths in the ordinary European cultivated forest, where they hunt deer with hounds and horses, with the thin grazing and thick fern, gorse, and scrub on so much of the New Zealand mountain and hill land, it is difficult to avoid the conclusion that the mountain areas of New Zealand, developed with good forest and small mountain farms on the European plan, would in the end actually carry more grazing than at present. The Governor-General of Australia in a recent speech advocated very broad grassed lines for the difficult fire-protection in Australia. Wherever there was any notable danger from fire in New Zealand there would be similar broad grassy lines. The Conservator of Forests, South Australia, where there is a complete system of fire-paths in the timber plantations, reckons an average of one-tenth the area under fire-paths. In South African forest plantations the ratio is more.

Then, again, as soon as the forest becomes regularized it offers large areas which, as they grow up out of reach of damage from grazing animals, are in these latitudes best thrown open to grazing, so as to keep down the inflammable undergrowth and assist in getting rid of the side branches from the tree-trunks. In the model forest of Leiria, in Portugal, I saw large flocks, even of goats. This is done to keep down the undergrowth and lessen the danger from fire in the inflammable pine forest.

In India, so great is the usefulness of the forest as a grazing reserve in times of famine that it has been declared that forestry in India was worth all that it has cost if only for the value of the grazing in the forest during times of drought.

FORESTRY SOCIETIES ABROAD.

It has for some time been seen in Australia that, owing to want of forestry, there is a yearly increasing economic loss, which amounts in the aggregate to an enormous sum. Lately, when drawing up a report on forestry for the West Australian Government, I took out the official figures, and this is what they show: When the war broke out the average timber importation to Australia was valued at three and a half millions yearly. The timber-export trade had not increased for some years, and amounted altogether to barely one million, while there was a two-and-a-half-millions importation of hardwood to Europe, which Australia with better forestry might have filled. Then there is the shrinkage in the home supplies of timber, making house-building and railways dearer, fencing-timber for farmers more costly, and causing indirect loss to various industries. Altogether, it is shown by official statistics that when the war broke out the want of good forestry was costing Australia at the least some eight millions yearly.

This position of affairs has led to the formation of an Australian forest league, which had its origin in the following resolution passed by the Inter-State Conference on Forestry held in Sydney in November, 1911: "That early steps be taken in each State to found an association for the advancement of forestry, to be styled the Australian Forestry League, the draft articles of association of such league to be drawn by local committees in each State." This was accordingly done, and the first general meeting of the League took place at Melbourne in November, 1914, the Governor-General of Australia presiding. I had the good fortune to be present at this meeting. The Australian Forestry League has at present but a small subscription of 5s. per annum. It is hoped this may be increased and a League periodical issued.

Other Australian associations that bring forward forestry matters from time to time are the Australian Natives' Association, the Million Club, and various Chambers of Commerce. So far none of these associations has done anything in the nature of exacting pledges from members of Parliament that a patriotic forest policy be insisted on, but they are constantly bringing forest matters before the public and the Government. The most consistent advocate of forestry in Australia has been the Melbourne *Age* newspaper.

AVERAGE MILLABLE RIMU IN THE WESTLAND FOREST.

Diameter, 22 in.; total height, 138 ft. [*Photo by D. E. Hutchins.*

In response to its strenuous admonitions the Premier of Victoria at the last elections sketched an extensive forestry programme.

In the United Kingdom, besides various small forest societies, there are two important ones with quarterly and half-yearly journals —the English Arboricultural Society, with a quarterly journal, and the Royal Scottish Arboricultural Society, with a half-yearly journal termed "Transactions." The ordinary subscription to each of these societies is 10s.

In Japan forest societies are numerous, and are recognized officially by the Government in the way that benefit societies and trade-unions are recognized in English communities. Indeed, a man living in the forest districts of Japan suffers certain civil disabilities unless he belongs to one or other of the forest societies.

There is an active Canadian Forestry Association in Canada, where public opinion requires a great deal of educating. The association inserts articles and cartoons in the newspapers, and distributes thousands of booklets designed to meet the prejudices and opinions of the various sections of the community.

In the United States the American Forestry Association is doing excellent work. Its journal, *American Forestry*, surpasses that of all other forest societies.

There are forest societies in all European countries, particularly the most democratic nations, France, Switzerland, Belgium, Denmark, and more recently Spain and Italy. The Touring Club of France is a powerful and wide-reaching organization, which for years has had an active forestry propaganda. It was under its auspices that was held in Paris in 1913 the great gathering of foresters from every quarter of the world except Germany.

THE NEW ZEALAND FORESTRY LEAGUE.

It is obviously important at this juncture that there be a forestry society in New Zealand, whose function should be twofold—(1) to gradually educate public opinion on forestry, (2) to see that no hasty action, due to the play of party politics, be allowed to pass unnoticed and interfere with the great far-reaching interests of the country in its national forestry. For this double purpose it will be necessary to issue forestry leaflets from time to time, and presently to establish a New Zealand journal of forestry after the model of the forest societies' journals of other countries. This is admirably done in Belgium, where membership of the forest society (of which I am a member, togethe with its magazine, costs 8s. per year.

Party politics, like all human institutions, have their good and bad points; and, unfortunately, national forestry in a new country nearly always comes in for most of the bad points. While the national forests of a country are in the melting-pot watchfulness is

ever necessary. The danger passes as public opinion strengthens and institutions crystallize. In France and Belgium party politics run very high, but neither Clericals nor Liberals would think for a moment of touching the national forest estates. The tendency is to increase the national forests whenever funds are available.

The New Zealand Forestry League should have for its watchwords "Immediate forest demarcation, and a forest loan and forest-development after the war." This would mean that the unnecessary destruction of forest would be arrested forthwith, and finally come to an end with the development of the forest, on modern lines, after the war. It would mean the opening-up of a certain amount of valley land for returned soldiers, and the provision of a good deal of employment in forest-development and roadmaking after the war, when employment is certain to be in great need.

It is scarcely reasonable to suppose that poor and steep mountain forest land can be developed in the same way as the rich lands of the plains where nature has been so prodigal. The history of land-development in the wet, mountainous forest-regions of southern Victoria shows this only too clearly — a destruction of national forest wealth to an appalling extent, and impoverished settlers who could not live as soon as the fertile ash of the burnt forest was exhausted. But, as we have seen, Victoria has now turned that page of its history.

By "State forests" is to be understood forests that are inalienably the property of the State and managed by a State Forest Department for national purposes, usually the production of timber. New Zealand has no State forests in this sense, no organized Forest Department, and only a fraction of its legitimate forest revenue. It has followed the erroneous policy of destroying its beautiful and valuable natural forests, thinking to replace them by plantations of exotics which, to furnish only the present consumption of timber, would cost the country at the rate of £19,000,000 for each crop of timber, less what reproduction can be secured by natural regeneration. This, as I have shown, is on the basis of the actual expenditure (plus interest at 4 per cent.) on the present forest plantations. The cost would be reducible (1) by sparser planting, and growing only the coarser kinds of timber in the plantations, as is being done in Australia; (2) by avoiding the fire and other losses that have occurred owing to want of technical knowledge.

As the ideal to which the New Zealand Forest League should direct special attention, I must again, at the cost of repetition, mention once more the mountain lands of the Vosges and Black Forest, on each side of the Rhine Valley in Europe, where every acre except the mountain-tops is rich forest or fair farm land; where the forest gives a net revenue up to £4 16s. per acre, and £2 10s. per

acre over considerable areas; and where living is cheaper than in any white man's country that I know. The climate and trees there are the climate and plantable trees of the South Island of New Zealand.

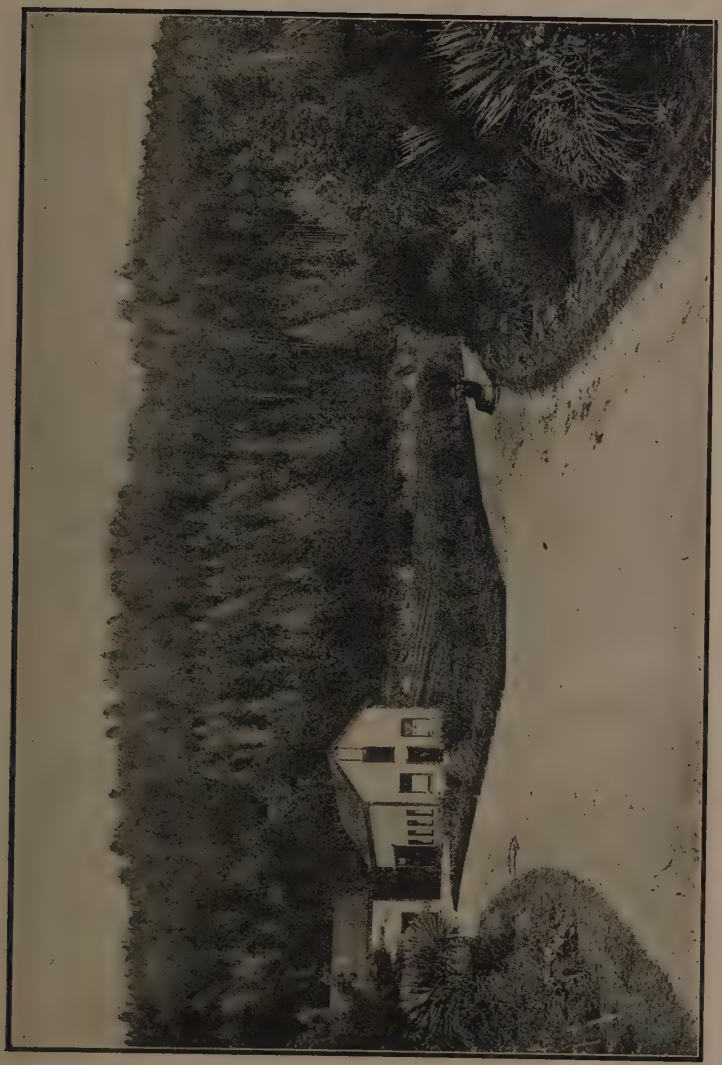
New Zealand has never seriously considered the forest question, which has been looked on as an amiable fad. In a democratic country the Government, naturally, will not deal thoroughly with the forest question without a mandate from the people; and the mass of the people know nothing about forestry in New Zealand as compared to forestry in other countries. That is why New Zealand wants its forest league.

SUMMARY.

To summarize: It is unthinkable that New Zealand, naturally a richly endowed forest country, should, in the future, have to import its timber from Australia or the Northern Hemisphere. The economic loss of doing so, with such bulky material, would be enormous. Dependence on imported timber, moreover, would materially increase the cost of living. Half the beauty, too, of this fair land would be gone if the forests were destroyed. There would also be a loss of population, and that, too, some of the pick of the manhood of the country; for the timber-milling industry, which still employs directly more hands than any other industry in New Zealand, would vanish, and the house-building, furniture-making, and tanning industries, also the prospective paper industry, would all be heavily handicapped with the dearness of their raw material. Lost, too, would be all the work such as now takes place in the cultivated forests of Europe, amounting in the best-developed parts of continental Europe to employment at the average rate of about one family per 130 acres.

To destroy the natural forest and replace it by artificial timber plantations would cost more than New Zealand with all its natural wealth could afford — and this only to find timber for the present population. That the native forests can be worked and preserved is shown by the experience of South Africa, which has been working its native forest scientifically and gradually improving it for the last thirty-three years. The native forest of South Africa closely resembles the New Zealand "bush"; they are both forests of the dense evergreen class, the majority of the best trees belonging to the genus *Podocarpus*. South Africa has spent, with interest, about two millions and a quarter on forestry, and that is a good investment if it stops one million and a quarter from going out of the country yearly for imported timber.

But the forest-clad mountains of New Zealand are being turned into sheep and cattle runs. The returns from the sheep and cattle



VIEW IN GOVERNMENT NURSERY, ROTORUA. EUCALYPT PLANTATION IN BACKGROUND.

they carry is but small compared to the loss of the national forests and the forest-working population. Too often when the ashes of the burnt forest are washed out there remains not even poor pasture, but only a waste of scrub or weeds, suggesting a good land-settlement pushed to a disastrous extreme.

For the present absence of a forest policy in New Zealand it is entirely unjust to blame the Government, which naturally in a democratic country can only reflect public opinion. Sir Julius Vogel's forest policy was in advance of public opinion and fell with him. The Forest Bill he introduced was a good one, but Parliament whittled it down to the present ineffective Forest Act. The Lands Department in New Zealand has raised a warning hand more than once, and its forest statistics have shown from time to time the grave dangers ahead—particularly the annual reports for 1907 and 1908. If there has been a cash expenditure of half a million on amateur forestry in New Zealand and one-third of that money practically wasted the Government cannot be blamed. There has been always a careful administration of public funds, but the system has been an impossible one. One might as well expect to succeed in building a railway without engineers. But this loss is as nothing compared to the many million pounds' worth of good forest that has been destroyed indiscriminately and without demarcation.

Public opinion on a national forest policy is practically non-existent in New Zealand at present. What other countries are doing with their forests is known to but a few. He who joins the forestry league and helps to make it known is a patriot who deserves well of his country.

Those who may hesitate about "joining another society" should take up the forestry league for a couple of years; for it looks as if the next two years would be the critical time for New Zealand forests, deciding whether New Zealand is going to save its forests with demarcation and a Forest Department, or sink to the level of a country without national forests.

The forests of New Zealand are still capable of restoration, but they are dwindling daily. The war and after-war labour conditions, connected with the returning soldiers, seem to offer during the next two years a last chance for the successful development of the native forests of the Dominion.

In the first part of the above article (October *Journal*, p. 299) it was stated that the South African yellow-woods grew to diameters up to 22 ft. This should have been 11 ft.

The address of the New Zealand Forestry League is P.O. Box 783, Wellington—Mr. E. C. Jack, Hon. Secretary. The annual subscription is £1 for members and 10s for associates.

ENSILAGE NOTES.

W. DIBBLE, Fields Inspector.

IT is satisfactory to note that progressive farmers in the dairying districts are taking an increasing interest in ensilage, and are proving that the profits from ensilage-fed cows are much in excess of those yielded by cows fed on hay at similar periods of the year, also that ensilage can be made by improved methods almost as cheaply as hay.

An excellent example of ensilage-making and its benefits has recently been afforded at the farm of Mr. J. E. Meuli, Okaiawa, Taranaki. A 22-acre paddock in 1914 was stumped, ploughed, sown in swedes, and fed off. During September, 1915, it was again ploughed and sown down to oats, grass, and clover at the rate of 1½ bushels oats, 18 lb. cocksfoot, 5 lb. Italian rye, 5 lb. cow-grass, 1½ lb. white clover, and 1 lb. alsike per acre. Early in 1916 the growth was cut and made into stack ensilage, the size of stack being 30 ft. by 30 ft. by 9 ft., estimated to contain 190 to 200 tons of cured ensilage. Eight bags of salt were used in the making. All necessary implements were used in the operations, including a Manitoba stacker for hoisting, and ten to twelve men assisted in carrying out the work. The cost of making the 22 acres of crop into ensilage—for labour and material—was about £29: say, 3s. per ton.

The stack was opened up and fed daily to 170 head of stock, commencing on 15th June and finishing on 10th September, 1916. The healthy condition of the stock showed the value of feeding ensilage, and I certainly have not seen a herd come through the winter in better condition this year. It may be noted that all the cows of the herd, 141 in number, calved without any assistance whatever, and in every case the afterbirth came away clean within a few hours. At the beginning of October only nine cows and heifers had not come into profit, and these were very close to calving. The bulls before being turned in with the cows in the previous spring had been fed on ensilage. Out of the herd fifty cows and heifers were put in a paddock of 7 acres during July and August last, and fed solely on ensilage (apart from pasture pickings) for eight weeks, the quantity given to them being one two-horse load daily.

The fact that the herd at the home farm, which was not a selected herd in any way (the fifty-six head including thirteen two-year-old heifers), produced 16,632 lb. of butter-fat last year, or an average of 292 lb. per head, must be considered very satisfactory, and proves that the animals did well on the ensilage provided for them during that season also.

In the writer's opinion ensilage can be fed with advantage to dairy herds from the months of June to October, and then again from February to April. There is no material conserved that is more similar to the natural herbage than first-class ensilage, and it tends to keep the cattle healthy. Owners would experience less trouble with various ailments in their herds if the cattle were fed liberally with ensilage at certain times of the year when necessity demands. There are still farmers who consider that a cow which has been through an exhausting milking season and is carrying a calf can be turned adrift and look after herself until she comes into profit again. But this is, of course, a quite mistaken idea. The period in question is the time when the cow should be fairly treated, in order that she may come in in good form for the ensuing season, which for best results should not be later than July. By getting an early start a much longer milking season can be obtained from the herd.

TIKI, DAM OF THE CHAMPION HEIFER MERE.

WORK FOR THE COMING MONTH.

THE ORCHARD.

J. A. CAMPBELL, Assistant Director, Horticulture Division.

HANDLING THE STONE-FRUIT CROP.

THE fruit season of 1916–17 is just commencing, cherries and apricots from the earlier districts being now on the market. The early varieties of peaches will soon be available; other classes and varieties of stone-fruits follow in quick succession, and by the end of December the stone-fruit crop will be well under way.

What the successful handling of a large stone-fruit crop means in care and labour can only be thoroughly appreciated by those who have been called upon to carry out the task. It can safely be said that no part of an orchardist's work calls for more energy, forethought, and a greater nicety of judgment than is required in successfully handling and marketing a crop of this kind, particularly when the market served is a distant one.

Peaches that have to travel a distance, besides being well packed, must also be in the proper state of maturity. If insufficiently mature when picked the fruit will either shrivel or fail to mature satisfactorily. A good deal of this class of fruit is marketed every season. In consequence many of the peaches on sale in Wellington and elsewhere are as unlike the real thing as possible, and serve to create a very false impression as to the real quality of the fruit produced in many of our peach-growing districts. On the other hand, if the fruit is overmature when packed it has a very poor chance of reaching the market in anything like a satisfactory condition. Ripe fruit should not be packed unless it is intended for immediate use.

At precisely what stage of maturity peaches should be picked depends to a great extent upon the conditions of marketing. It is here where the judgment and experience of the grower come in. Appearance is the main guide. Each fruit should be full and plump, and showing a fair amount of colour according to the variety, but still firm and hard when required for forwarding to a distance.

Peaches swell rapidly during the few days prior to ripening, a considerable change taking place from day to day. This, as the

whole crop of a tree does not develop evenly, necessitates several pickings, which should be done early each morning to allow of as much of the fruit as possible being placed in the packing-shed while still cool. In any case, peaches as well as other fruits should be removed to a cool shed as soon as convenient after picking, as it is detrimental to leave them about in cases in the hot sun prior to packing.

The labour of harvesting a peach crop is considerably lessened when the fruits are well developed and even in size. To ensure this condition it is necessary to keep the tree in good heart. In this, pruning, spraying, cultivation, and manuring, combined with a satisfactory rai fall, play the principal part. In rainfall nature has done its part this season, and if the grower has attended to the other essentials, including the most important work of systematically thinning the fruit, the season's peach crop should in all respects prove highly satisfactory.

SUMMER PRUNING.

This work, which for the present is confined to the thinning-out of surplus and misplaced wood and the checking of dominant growths for the purpose of balancing the tree, is of considerable importance to a young orchard. In this way the shape of many young trees can be corrected and improved. Select the growths that provide the best framework, and entirely remove those that are not required; by so doing the flow of sap will be diverted to the benefit of those retained. This work should be commenced early and completed in December or early in January, otherwise considerable injury might be done; for it must be remembered that the pruning of a growing tree has a more or less weakening effect on the tree according to the amount of foliage removed in the operation. Ordinary summer pruning for fruit-production has mainly this object in view, but the position is different with the young tree. Although the check through cutting-out applies in the latter case, it is only temporary, and is compensated for by the increased strength given to the branches that are retained. This result, however, is obtained only when the pruning is done early enough to allow the tree to recover from the shock and to make a satisfactory growth before the sap ceases to flow.

CULTIVATION.

Although there has been a good rainfall generally, the hot weather of the season is yet to come. It will be inadvisable to risk excessive loss of moisture and a luxuriant growth of weeds by

neglecting cultivation. The surface of the soil should be broken up every three or four weeks as usual.

TYING UP.

Trees having a weak framework, if unsupported, will soon be bowing down with the weight of their crops. To prevent this some adequate system of supporting the weak branches should be adopted before the weight of fruit renders the work much more difficult. Some particulars as to methods of tying-up were given in the *Journal* for November, 1915, page 444.

SPRAYING.

The principal diseases affecting the orchard for which spraying will be required at the present time include codlin-moth, leaf-roller caterpillar, pear-slug, black-spot, powdery mildew, and red mite.

For the control of codlin-moth, leaf-roller, and pear-slug spray with arsenate of lead in the ratio of 1½ lb. to 2 lb. (paste) or 1 lb. to 1¼ lb. (powder) to 50 gallons of water.

For pear-slug affecting stone-fruit use arsenate of lead at one-half the strength recommended for codlin-moth.

For black-spot, powdery mildew, and red mite spray with commercial lime-sulphur at the rate of 1 part to 100 or 120 of water.

Lime-sulphur can be combined with arsenate of lead for the control of the above diseases on pip-fruits.

For red mite on stone-fruits spray with lime-sulphur 1 to 125 or 130, or use the whale-oil-soap spray, which is preferable.

THE POULTRY-RUN.

F. C. BROWN, Chief Poultry Instructor.

THE growing pullets must now be given the very best of care so that they shall not fail in their future function of winter-egg producers. The slightest set-back in a growing bird is never caught up. One thing that must be sedulously guarded against is overcrowding. Of course, the plant will be now taxed to its utmost capacity, but it is only inviting trouble to make the buildings carry more stock than they are capable of properly

accommodating. It will generally be found more profitable to cull out some of the drone type of hens or the surplus cockerels rather than place the pullets in overcrowded quarters.

As is the case with birds of all ages, an ample supply of good food is imperative for growing pullets, of which good plump crushed oats should form the bulk of the ration. An inferior grade of oats should never be fed, as they are next to useless as a poultry-food. Care must be taken not to oversupply forcing-foods such as meat or its substitutes; especially does this apply when birds are indicating early maturity. Early maturity is all very well to a certain degree, but very often too early maturity means false maturity. Even with the early-maturing breeds, such as Leghorns, &c., they should not commence to lay till they are at least six months old. Green food should be supplied in abundance, while grit and clean water should be always available. Good shade is also an essential for the well-being of young stock at this season of the year.

Now that the warmer weather is approaching, vermin will commence to give trouble, and unless precaution is taken in regard to cleanliness and keeping these parasites at bay the developing stock will seriously suffer in consequence.

INTERNAL PARASITES.

It is not generally realized by the majority of poultrymen what a great loss of poultry-stock occurs annually through the birds being infested with intestinal worms. Many cases have recently come under my notice of heavy mortality and a reduced egg-yield through no other cause, and the matter is one that should receive special attention at the present time. While there are many species of these internal parasites, the most common source of trouble is known to the poultryman as the round worm, which measures from ¼ in. to 3 in. in length. A few worms may not seriously affect the health of a bird, but if present in large numbers they will sooner or later cause serious trouble. Adult stock of exceptional vitality may also lay fairly well for some time even when badly affected, but the weaker birds of the flock will generally succumb. The effect of worms is most destructive to chickens at an early age. Recently a case came under my notice where heavy mortality was taking place from some unknown cause among chickens of from eight to ten weeks old. An examination of the intestines of some of the ailing birds showed that these contained worms varying from ¼ in. to 3 in. in length and nearly as thick as an ordinary darning-needle.

By making a post-mortem examination of any birds that die, or that are killed as being suspected of having worms, the poultryman may keep himself aware as to whether worms are present in his flock or not. If the digestive tract is followed and opened by means of a sharp small-bladed penknife any worms that are there will readily be seen. The large worms will be found in the small intestine, while the small ones are principally found in the appendix. When fowls are badly infested with worms these will be found in the droppings. Sometimes the worms expelled in this way are of a deep-red colour, and are often mistaken for a small clot of blood.

The most common symptom of the trouble is that the birds stretch their necks and make a screeching noise—a sound similar to that made by a seagull. This noise is often thought to be a throat trouble or croup. Other symptoms are a ravenous appetite, unthrifty condition, unkempt appearance of plumage, the comb black and the face pale; while a frequent yawning may be noticed.

There are several methods of treatment, but perhaps the most simple, and one that is rapidly effective, is to starve the affected birds for a day, and then give them a dose of Epsom salts (say, a 1 oz. packet for every twelve birds), dissolving this in the water with which the mash is mixed, adding also to the mash some sulphur (about the same amount as the salts), which should be thoroughly well mixed with the ingredients before thay are moistened. The effect of this diet, given after a fast, will be to expel the worms. Care must be taken to thoroughly clean up and effectively destroy the droppings after treatment, or the birds are apt to eat the worms expelled. It is well, therefore, to confine the affected birds during treatment in a small space, so that the cleaning-up process may be properly carried out and lessen further risk of infection. Where the treatment has not been efficacious it should be repeated in a week's time.

This trouble, like most others that affect poultry, is usually found on dirty neglected plants, and the fact cannot be emphasized too strongly that prevention is the one thing to aim at in keeping it at bay. Too much importance cannot be placed upon the necessity of cleanliness and of preventing the runs from getting tainted. They should be periodically turned up, well limed, sown down, and, if possible, given a rest. This can be easily arranged if double runs are provided. The houses should be kept in a sanitary state and frequently sprayed with a strong solution of sheep-dip or other good disinfectant.

FARMERS AND PUREBRED STOCK.

The egg-laying competitions have taught the farmer many lessons in regard to the management of poultry, and probably the most important one yet conveyed is the great superiority of purebred stock as compared with crossbred or barnyard fowls. Until recent years the great majority of poultry kept on the farms were of a nondescript class, and it was generally admitted that they did little more than pay for the food they consumed. Purebred stock were certainly available to the farmer previous to the inception of the egg-laying tests, but these were chiefly bred from a show viewpoint. Farmers generally preferred the crossbred or barnyard bird for ordinary purposes rather than what was then considered an ideal show specimen. This is not to say that birds conforming to the standards framed by the English poultry clubs did not combine laying-points with those of breed type. The reason the show bird was considered unsatisfactory for egg-laying purposes was solely due to the judges favouring fancy abnormalities and ignoring the useful points as laid down in the plates of the original standards.

While judges have made mistakes in departing from Ludlow's plates in Lewis Wright's great work, the fact should not be forgotten that the greatly increased egg-production that has taken place during the last few years could never have been achieved had it not been for the work performed by the fancier. It was the fancier who by careful selection and a love for his work made and brought to perfection the beautiful breeds of poultry we have at our command to-day. It is a recognized principle by all who have concerned themselves in the advancement of types in the animal kingdom that it is only the type which has been bred true to a given standard from generation to generation that has the power of transmitting desired characters. The fancier in fixing the types and characters of the various breeds undoubtedly did a great work, and still deserves the credit of building the foundation of all the heavy-producing stock of to-day. It is obvious that the making of a breed and bringing it to perfection was of much greater importance than merely improving it from an egg-producing viewpoint. After all, the high-class layer is of a distinct type which stands out conspicuously to the man who knows his business. The more I study the best-favoured birds which compete in the egg-laying tests, and also those in the utility classes, the more I am convinced that from a breeding viewpoint we have only revived the same class of bird as that of the ideals drawn by Ludlow for the various English poultry clubs probably thirty years ago.

It is gratifying to see the farmers showing their appreciation of the great advancement of the egg-yielding power of many breeds of poultry-stock. There are now few farms where purebred birds are not kept. The egg-laying competitions have sounded the death-knell of the barnyard fowl, and to a great extent of the extreme show specimen. Not only do the farmers realize the advantage of keeping purebred stock, but they also realize the importance of poultry shows. Up to a few years ago poultry shows were concerned solely with the exhibition of birds judged according to an extreme show standard. It was then an exceptional case to see a farmer exhibiting his fowls. Now that classes are provided for utility-stock—birds of laying type which combine with egg-productive power the desired characters of the breed—there is a gratifying tendency for the farmer to take a keen interest in the exhibition of his utility-poultry stock.

Some of the finest specimens I have judged during the past season have been owned by farmers. A very important work is being taken up by some of the agricultural and pastoral societies in this direction. At the recent show of the Ellesmere Agricultural and Pastoral Association, where I judged, there was staged a remarkably fine collection of useful stock. It was certainly the best I have ever seen outside of a poultry show proper, and the most pleasing feature was that the majority of the birds were owned by farmers of the district. True, the time of the year was all against the birds being shown to the best advantage. The display was, however, an object-lesson, which should serve a most useful purpose in creating an interest in poultry-rearing in the district as well as doing good work for the industry, especially seeing that the display was witnessed by those who require the lesson most — the farming community. The exhibit formed a strong contrast to that usually seen at our country agricultural and pastoral shows. Instead of consisting of a small motley collection, the 125 birds benched were, with few exceptions, good specimens of the breeds they represented. At the Poverty Bay show last month another very fine collection of 160 birds was exhibited. This is by far the largest entry I have yet judged at any agricultural and pastoral association fixture apart from winter shows. These two progressive associations are to be congratulated on the success of their efforts, and it is to be hoped that other societies will take up the movement in a similar manner.

Another important movement that is being set on foot by certain farmers' organizations is in regard to taking advantage of the assistance given by the Department to foster the industry. The idea of these bodies to arrange meetings, whereby those

interested may be afforded an opportunity of attending lectures and demonstrations by the Department's poultry instructors, must in the near future prove of great educational value. It is also gratifying to know that the farmer is taking full advantage of the opportunity afforded by the Department's poultry plants to secure at moderate prices birds and eggs for breeding purposes from tested strains.

THE APIARY.

E. A. EARP, Apiary Instructor.

NUCLEUS HIVES.

DURING the summer months every attention should be paid to raising a stock of young queens to replace old and failing ones. To buy new queens each successive season is too expensive, and with a little attention and care good queens can be raised by the beekeeper in his own yard. An apiary should be requeened each year, and queens should not be tolerated for more than two seasons at the most. In the long-run it is the queens that tell in the production of big crops, and unless the beekeeper takes the trouble to requeen in the summer only a small percentage of the stocks will yield a surplus.

In order to facilitate the work of queen-rearing a few nucleus colonies should be run in conjunction with every apiary. In these small colonies queens can be raised and cared for until they are mated and laying. It is an easy matter once the queens are laying to transfer them to the larger hives in the apiary. Perhaps no branch of apiculture receives less attention than the production of young queens; and yet if the beekeepers who get the big crops of honey are asked what counts most in their production the reply is invariably "young queens." In New Zealand it has been proved over and over again that the best months for raising queens are from November to January. During this period everything is favourable for the operation, as the hives are at their highest state of prosperity. Under normal conditions the workers and drones are at their best, this being the swarming-period.

The best style of nucleus hive to adopt is the four-frame one. This size will give the young queen a chance to lay once she is mated, and will, besides, hold sufficient bees to care for relays of queen-cells throughout the season. To form a nucleus colony take one frame of well-capped brood with adhering bees, and one frame

containing honey and pollen, the remaining space being filled with an empty comb and feeder. If the number of bees on the comb is not sufficient to form a good cluster, one or two frames of young bees may be shaken into the nucleus, this being done to replace the field-bees which return to the old hive. Place the frame of brood in the middle of the hive and close the entrance until the following day, when the bees may be released. In the course of a day or two the small colony will settle down, and will then be ready to receive the first queen-cell.

No better plan can be followed by the beginner than to utilize queen-cells produced naturally—*i.e.*, under the swarming impulse. In removing cells from the hives select the largest and most corrugated ones, and cut well into the combs so as not to injure the queens. Care must be taken not to shake the combs containing the queen-cells, as the sudden jolt jerks the larva from its base and the embryo queen will be destroyed. Before inserting the cell in the nucleus hive be sure and examine the comb, in case eggs were transferred with the frame of brood. Should queen-cells be found, destroy these, and the cell can then be grafted with safety. A hairpin makes an excellent tool for holding the cell in position. If the weather conditions are favourable, the queen should be laying within a week after hatching, and when eggs appear in the hive the beekeeper may conclude that she is safely mated. Leave the queen in the nucleus hive until she has proved her laying-capacity, when she may be taken to replace an old or failing one in the apiary. If more queen-cells are available, which is almost certain to be the case where swarming is in full swing, a ripe one may be inserted to take the place of the young queen, and this can be repeated at intervals until the necessary number of queens is raised.

It must be left to the beekeeper to regulate the number of nucleus hives he requires, this depending upon the number of queens to be raised. There are several methods of artificial queen-raising, and details of these can be obtained from text-books on the subject.

FOUL-BROOD.

Nothing retards successful beekeeping more than the ravages of foul-brood, and if bees are to become profitable every effort must be concentrated on the eradication of this disease. As advised previously, the beekeeper should familiarize himself with the symptoms, so that he can detect the appearance of the disease in its early stages. No set time can be given for its treatment, but it may be carried out as soon as settled weather sets in and when nectar is being freely gathered. There are many methods of treat-

ing the disease, but none is as effective as the McEvoy plan. Some of the systems practised are extremely dangerous in the hands of the beginner, and he will be wise if he keeps to the McEvoy treatment, which is the best and safest method practised. When treating a colony there should be sufficient bees to form an average-sized swarm. If, however, disease has reduced the colony until there is only a small cluster of bees left, it is advisable to destroy the colony, and remove all infected combs and the hive to a place of safety until such time as it can be properly cleansed. Full particulars for the treatment of foul-brood are contained in the Department's Bulletin No. 1 (New Series), which can be obtained free on application.

A word of caution may be given to the beekeeper in whose colonies disease reappears after treatment. Many beekeepers resort to cutting out the infected cells, and even some text-books advocate this dangerous practice, but it is only tinkering with the disease. Such advice is misleading, and is certainly not effective in eradicating the trouble. When diseased cells reappear after treatment by far the safest plan is to make use of a modified form of the McEvoy method. In place of shaking the bees on to strips of foundation or "starters" for four days, the bees are shaken on to nine sheets of foundation and an empty "bone-dry" comb, this being inserted in the centre of the hive. At the end of twenty-four hours the comb can be removed, and a frame containing a sheet of foundation put in its place. This operation should be performed quietly and quickly, with the use of very little smoke. The object of inserting the dry comb in the centre of the hive is to induce the bees to store the honey which they took from the diseased hive when shaken. When removing the comb this diseased honey is also removed. If carried out with care this treatment will be entirely successful.

STIMULATIVE FEEDING.

As advised previously, a constant watch must be kept on the stores in the hive. During the flow from the willows and fruit-bloom brood-rearing is increased enormously, and the stores will rapidly dwindle during the period that follows. In order to keep up the strength of the colonies after the cessation of the fruit-bloom artificial feeding should be resorted to until the beekeeper is certain that the clover is yielding nectar. In most districts there is a distinct break between the spring blossom and the clover, and it is not uncommon to find populous hives on the verge of starvation. Hives that are gently stimulated will respond to the treatment, and be in good order to work the main clover crop.

The quantity of syrup to be fed will depend largely upon the strength of the hives. If stimulative feeding has to be resorted to, sugar syrup may be fed in a less concentrated form than that which is given in the autumn and spring months, the quantity of water being increased. A syrup fed in the proportion of one of sugar to six of water is all that is required to stimulate the bees and prevent starvation, and will be the means of keeping the colonies strong in brood and bees. It must be remembered it is strong colonies that count in a flow, and no others should be tolerated during the busy season.

EXTRACTING.

Preparations for extracting the honey must now be well in hand. In the northern parts of the Dominion, where the flow is much earlier than in the south, operations may have to be commenced towards the latter part of the month. This, however, will depend largely upon the weather prevailing. Usually the main crop is taken in January, but in Southland last season extracting was not in full swing until February, and was not completed till March. The main appliances requisite to successful work are an extractor, uncapping-knives, uncapping-can, and a good tank. It is poor policy to wait until the flow commences before securing the necessary plant. It is not uncommon to find a beekeeper unprepared, and the loss attendant on delay often renders a season's work unprofitable. The main flow of nectar lasts but a short time and full advantage must be taken of the short period to secure the largest possible return.

THE FARM GARDEN.

W. H. TAYLOR, Manager, Arataki Horticultural Station.

VEGETABLE-CULTURE.

WHEN these notes appear it will be time to cease cutting asparagus. Heads should still be coming up freely, and it is necessary that a large number be left to mature, for on them next season's crop depends. A dressing of nitrate of soda (1 oz. to 2 oz. per square yard) would be beneficial, also a good mulch of stable or farmyard manure. When the growths become tall the heavy heads are liable to be blown over by strong winds, and if the stems are broken harm is done. The plan I have found best is to cut off the tops of the heads when they are

about 3 ft. high. This does not affect the strength of their growth; it merely encourages the development of side branches, which is quite as good for the roots as greater height. If the bed is doing well — that is, making good growth — the branches of the various heads will interlock, and the mutual support secured will prevent any being overblown.

Peas and French beans may be sown for succession. It is not too late to sow marrows, pumpkins, cucumbers, and melons, though they should have been put in before. Similarly, red-beet, parsnips, and carrots may be sown, though the results may not be quite so good as if sown a month ago. Onions may be sown for salading now that the ordinary crops are becoming too large for that purpose. Onions for pickling may also be sown. Select a plot of free but not overrich soil, tread it down firmly, sow thickly, and do not thin the plants. Silverskin is the best pickling variety. An early kind of cauliflower planted now would come in to use between Autumn Giant, put out early, and those sown (as advised for September) for putting out near the end of the year. Broccoli and Brussels sprouts should not be left to crowd each other in the seed-beds; either thin the plants, or, better, prick out in nurse-beds the numbers required. Place them 4 in. or 5 in. apart; here they will make fine sturdy plants. Plant red cabbage.

Tomatoes will be making growth by now. The mode of training will no doubt have been decided, but whatever the plan may be a certain number of branches will be necessary, either one, two, or three; and whatever the number decided on, these must be kept free from side shoots. All lateral growths should be cut off as soon as possible after they appear. It is bad policy to try to force growth by watering or any other means; the plants naturally make far too much growth. Short-jointed hardy plants are what is wanted. This condition is best secured by planting in good but not rich soil, by refraining from giving manure of any kind at time of planting or before, and by giving a light dressing of superphosphate and bonemeal after the first fruits have set, or earlier in places where rainfall is usually light. Apply twice as much superphosphate as bonemeal. Apply the manure to about a yard wide about the plants, half on each side giving 3 oz. of the mixture per square yard, and scratching it in with a rake or hoe. If the plants appear as though they want waking up, add 1 oz. per yard of sulphate of ammonia; but withhold this if the plants are making fair growth, as in such circumstances forcing agents of this sort are liable to induce a state of growth that renders the plants liable to disease. Numbers of the market-growers, those who grow many thousands of plants, let the

plants lie on the ground. The plan answers well in dry seasons, but if the season proves wet disease is usually prevalent. Though my experience has been that disease is seldom troublesome when tomatoes are grown on the lines above laid down, yet it is a wise precaution to spray two or three times with 4-4-40 Bordeaux mixture. It should be kept in mind that the only remedy for disease is prevention; it cannot be cured if it gets a firm hold before spraying.

Broad beans that are becoming tall may be topped with advantage.

The satisfactory progress of all crops depends largely on proper cultivation of the soil; keep it loose on the surface by frequent stirring.

SMALL FRUITS.

Raspberry plantations should be kept free of useless suckers by hoeing or with a grubber. Unless wanted for new plantations all suckers should be cut out while quite small. Weeds should be suppressed as much as possible, particularly any such as couch. Couch-grass is very destructive to raspberries. I have seen a fine plantation rendered fruitless by it; if it appears, grub it out as soon as seen.

Gooseberries. — When bushes are too crowded a thinning of strong shoots should be undertaken. It is bad to pinch or cut shoots back, as they grow again duplicated and make matters worse. Frequently there are a number of strong shoots thrown up from the lower parts of the bushes, especially when branches have been cut. These shoots should be got rid of by tearing them off at the base. Regard should, however, be had for the possible advisability of keeping some to replace old worn branches which it may be determined to cut out later. When this is decided on the old branches should be cut out immediately after the fruit is gathered, which is much to be preferred to leaving them till winter, as their early removal will afford the new growth a better opportunity to develop.

Red Currants.—The treatment should be entirely different to that given to black currants, red currants bearing fruit only on wood that is more than one year old. It unfortunately happens that the varieties that bear best are the most difficult to make into good bushes. The good varieties are all of the La Versailles type: the young wood is gross, heavy, and brittle. The shoots are easily blown off by wind, and at the best are liable to become twisted and grow out of shape. In large plantations one hardly ever sees good bushes; they are ill-shaped and scraggy as a rule, which means that they are not producing more than a tithe of the fruit they should bear. A hollow centre is imperative to a proper state of fruitfulness, and evenly spaced branches are

inseparable from a full crop. In a small cultivation this end may easily be attained by employing hoops to which to tie the branches, but with a large number of bushes this is not practicable. Much may be done by summer pruning, both in preventing the loss of shoots from wind, and in the increase of fruit. Heavy leading-shoots are most liable to injury; these may be topped when they have made 1 ft. of growth. When they break again the resulting shoots may be reduced to one on each leader: this will prevent their getting too tall, and at the same time assist in the ripening of the portion that will be left at the winter pruning. The fruit is borne on spurs; to induce their formation, when side shoots have grown about 1 ft. cut them back to 6 in. Next winter these side shoots should be further shortened to 2 in.: it is on the portion of wood then left that the fruit will be borne. If the summer shortening is not done it usually takes two years to bring them to a fruiting state, against one year if the shortening is carried out. The shortening at this time must not be more severe than as described, for growth will ensue for every shortened shoot, and if it were more severe it would be the buds wanted for fruit that would develop the new shoots. The purpose and effect of the present shortening is to admit light, and incidentally, by arresting the progress of the shoots, to strengthen the buds at the base.

Black currants may be allowed to make their growth their own way. *White currants* are treated the same as red.

[*Loganberries* will be dealt with in next month's notes.]

THE FLOWER-GARDEN.

Rose Enemies.—These pests are more numerous than is commonly thought. They are most troublesome where anxiety to excel leads to indiscriminate feeding and frequent watering of the plant. This often brings about a soft condition of growth and, not infrequently, bad root-action. The safest plan, and the one that leads to the most satisfactory results, is, firstly, thorough preparation of the soil by deep trenching; secondly, well manuring the soil; thirdly, thorough cultivation of the soil by keeping it well stirred as to the surface; and, lastly, not watering too often, and when it is done giving a good soaking, so as to moisten the soil right through, not merely at the surface. Hosing the tops in the evening after a hot day will do good by refreshing the foliage, and also by washing off insect pests.

Green-fly or rose-aphis is easily destroyed by means of any of the many contact insecticides sold, such as Vistolene, Clift's Fluid, Nikoteen, fir-tree oil, &c. I have used all these pre-

parations: it is only necessary to follow the directions given on the bottles, taking care not to exceed the strength advised. Mildew is very destructive if neglected, and is not easily suppressed; treatment is referred to later on. Grubs and caterpillars attack the leaves, which curl up, and the pests cannot then be reached by a spray, the only way to get them is to crush the grub by squeezing with a finger and thumb. This is really less troublesome than spraying would be, as no preparation is required, and it can be done whenever the insects are detected.

In regard to fungoid diseases, it must be distinctly understood that in the majority of cases preventive measures are the only rational procedure to adopt. When infection takes place the parasites spread in the living tissues of the plant, consequently they cannot be reached by a spray, and no effectual remedy can be applied that will not seriously injure the plant. Infection always takes place by means of spores falling on to a leaf; the spore, on germination, passes into the interior of the leaf, and commences to form spawn or mycelium, which grows at the expense of the materials accumulated by the plant for its own use. It is a mistake to suppose that plants become suddenly affected; the impression arises from the fact that it takes from one to two weeks after infection for the effects to become visible. Infection takes place from outside; one affected bush if neglected may cause an epidemic.

In the case of rust and black-spot the winter spores, or those spores that start the disease the following season, are produced on the leaves. These infected leaves mostly fall to the ground in due course, and many are blown into nooks and crannies, where they remain till the following spring, when the winter spores produce other spores, which are dispersed by wind and renew the disease. As far as possible all infected leaves should be collected and burned, also those that remain on the bushes at pruning-time. Whatever care may be taken some are bound to escape, and as there are sure to be gardens where no care is taken, these will infect others. The cleanest bushes are to be found in places where cleanliness prevails, and that are at a distance from others.

From the foregoing it will be seen that preventive measures are the only effective means of dealing with black-spot and rust. Whatever may be done after the disease has appeared may be of use in preventing it spreading, but will not save the affected plants from injury. It may be stated that some parasitic diseases live in the tissues of plants, and in those cases disease may be perpetuated without further infection from without. This, however, is not the case with rose-mildew, rust, and black-spot, the three

most destructive and frequent diseases roses are subject to. The remedy for mildew is potassium sulphide (liver of sulphur), 1 oz. to 10 gallons of water, to be applied on the first sign of mildew, remembering that prevention is both easy and certain, while once the disease has a firm hold a cure is impossible. This strength of wash is for the first spray, when the foliage is young; at later periods the strength may be doubled. The same treatment is effective against rose-rust, which does not form winter spores on the wood but only on the leaves. Powdered sulphur dusted on through a piece of fine muslin and the treatment repeated as long as any mildew is visible can also be recommended.

All bushes that have been attacked by any kind of fungus should be thoroughly drenched with a solution of sulphate of copper—1 oz. to 2 gallons water. This must be done at mid-winter when the bushes are quite dormant.

Black-spot affects the leaves only. Badly affected leaves should be removed and burned; spraying does not appear to arrest the disease when once the bush is affected. Bushes that have been previously affected should be sprayed with sulphide of potassium as described above, commencing with the opening of the leaves and continuing at frequent intervals to prevent infection. There are many other pests that affect the rose, but the most common have been dealt with above. It may be added that Bordeaux mixture is more effective than sulphide of potassium, but there is more danger of burning the foliage, and the spray has an unsightly appearance on the plants. On these accounts it is usually barred from use.

FORTHCOMING AGRICULTURAL SHOWS.

Otago A. and P. Society: At Dunedin, 29th and 30th November.
Stratford A. and P. Association: At Stratford, 29th and 30th November.
Auckland A. and P. Association: At Auckland, 1st and 2nd December.
Southland A. and P. Association: At Invercargill, 12th and 13th December.
Tuapeka Agricultural Society: At Lawrence, 13th December.
Helensville A. and P. Association: At Helensville, 29th January.
Woodville A. and P. Association: At Woodville, 31st January.
Feilding Industrial A. and P. Association: At Feilding, 6th and 7th February.
Opotiki A. and P. Association: At Opotiki, 8th February.
Pahiatua-Akitio A. and P. Association: At Pahiatua, 9th February.
Dannevirke A. and P. Association: At Dannevirke, 14th, 15th, and 16th February.
Hukerenui Agricultural Association: At Towai, 15th February.
Northern Suburban A. and H. Assn.: At Takapuna, 16th and 17th February.
Northern Wairoa A. and P. Association: At Mititai, 17th February.
Masterton A. and P. Association: At Masterton, 20th and 21st February.
Taranaki Agricultural Society: 28th February and 1st March.
North Kaipara A. and P. Association: At Paparoa, 7th March.
Ashburton A. and P. Association: At Ashburton, 14th and 15th March.
Oxford A. and P. Association: At Oxford, 12th April.

(A. & P. Association secretaries are invited to supply particulars of their show dates.)

ANSWERS TO CORRESPONDENTS.

IN every instance a question to which an answer is desired in these columns must be accompanied by the full name and the postal address of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written on one side of the paper only.

LOSS OF CUD IN COW.

"SUBSCRIBER," Owaka Valley, Otago :—

Would you please inform me of a remedy for loss of cud in a cow. About the middle of June I turned this cow with three others into the native bush and let them run there for five or six weeks. This cow and another one came out, and I reckoned they had bush fever—viz., loss of power in the hind quarters (staggering)—but otherwise in good condition, so I turned them on turnips. One got apparently all right, but this one, though she is milking fairly well, I have never seen chew the cud ; she just stands and grinds her teeth as if she were trying to get the cud. Of the other two cows I turned into the bush, one never came out, so I presume she died of bush-fever ; the other one was all right.

The Live-stock Division :—

The complaint in this case is probably due to the cow eating the leaves of a shrub known as hinahina (*Melicytus ramiflorus*), the action of which is supposed to produce a certain paralysis of the walls of the stomachs, thereby diminishing their peristaltic action. Treatment consists in giving the cow an aperient drench —Epsom salts ¾ lb., ground ginger 2 teaspoonfuls, mixed in a quart of thin gruel. A course of nerve-tonics should then be followed, such as the following : Nux vomica 2 drams, pulv. anisi. 6 drams, pulv. lini. 2 oz. (to be obtained from a chemist); a sixth part to be given every other day, mixed in a little feed or in a quart of gruel. The animal should be pastured on young succulent feed, but not to such length of time as to cause her to be blown.

BORER IN FRUIT-TREES.

M. J., Tarewa :—

Will you kindly let me know if there is a cure for the borer in fruit-trees ?

The Horticulture Division :—

To prevent borer affecting fruit-trees it is necessary to keep the bark of the tree free of moss and lichen, and to guard against dead wood, snags, &c., through which the borer invariably finds entry. Cut away all wood already affected, if such is practicable without permanent injury to the tree. Treat affected branches that are too large to be removed by injecting a little benzine (by means of an ordinary oil-can) into the cavity in which the grub is located, and plug the hole with soap or clay.

PIG-FATTENING FOODS.

A. HILL, Gisborne :—

Kindly inform me which is the cheapest food for pig-fattening—ricemeal at £4 10s., or pollard at £6.

The Live-stock Division :—

The analysis is slightly in favour of the ricemeal at £4 10s. Possibly better results will be obtained from pollard, especially if supplemented with crushed grain or almost any kind of meal to finish off.

ERADICATING BURR-CLOVER.

W. A. A. RYDER, Riwaka :—

I have a piece of heavy clay land infested with spotted burr-clover. It had been sown in grass, but this weed smothered it, and now the ground is covered with the seed burrs of last year's crop. I am ploughing under the present growth as green manure. Kindly advise as to the best method of ridding the soil of this weed.

The Fields Division :—

The only feasible way of getting rid of burr-clover is ploughing it under before the seeds form, and keeping the land cultivated periodically with a spring-tooth cultivator as the clover-plants appear. Frequent and timely cultivation is the line along which you should work.

GRAFTING ORANGES.

"SUBSCRIBER," Opua, Bay of Islands :—

I should be very pleased if you would tell me the best month for grafting oranges. Also, should the scion be taken off the tree and buried, or can I take the scion straight from the tree?

The Horticulture Division :—

September is the best time for grafting oranges or lemons. It is not necessary to take the scions off the tree that is to be propagated till the grafting is to be done. The citrus family differ in this respect to the ordinary deciduous fruit-tree. Good scions can always be selected from any well-grown tree. Select a portion with not less than three buds on it. Take it, if possible, from a branch that has borne fruit, choosing well-ripened round wood. Avoid using the angular unripened portions. Cover the union and top of stock with grafting-wax as soon as possible after the operation. If grafting old trees where the branches have to be cut back to thick wood, use the rind graft; if young trees, the ordinary whip graft. Budding in the autumn, however, is the most successful method of propagating young trees.

HORSE WITH CHRONIC COUGH.

C. C. E., Oxford :—

I have a gelding that is affected with a very severe cough. The trouble is of long standing, but until recently the cough was not distressing. Lately the horse has been so bad that at times he is quite off his feed, and is not in a fit condition for ordinary work. Apparently the irritation is in the lungs, for when a coughing-fit comes on the stomach works and contracts like that of a broken-winded animal. Otherwise the horse is perfectly healthy, has a good skin, and is in very fair condition. Can you tell me the cause, and suggest a remedy for the cough?

The Live-stock Division :—

We should advise you to obtain the services of a qualified veterinary surgeon, who would determine the cause of the cough. From the symptoms given in your letter it is impossible to say whether the lungs or larynx are affected, and treatment would consist accordingly. In many cases of chronic cough a tablespoonful of cod-liver oil mixed in the feed twice daily has proved beneficial. All hard feed must be damped.

MANURE FOR LEMON-TREES.

"ANXIOUS," New Lynn, Auckland :—

Please let me know what you consider the best manure to give lemon-trees that are twelve years old. They have been bearing very consistently. I have manured them from time to time, but do not know whether I have given enough. They have a good crop on just at present, but the fruit is small; otherwise the trees look all right

The Horticulture Division :—

The best manure for the purpose is well-rotted stable manure, if such is available, but where it is not the following is recommended : Bonedust or blood and bone 5 lb., superphosphate 1½ lb. to 2 lb., sulphate of potash 2 lb., per tree.

SHELTER-TREES.

"PINUS," Albany :—

What is the best manure to use for pine-seeds ? I tried to grow some *muricata* pines from seed last October, and although a lot came up most have gone sickly and died. Which are the best shelter—*muricata* pine or *macrocarpa* ?

The Horticulture Division :—

Both *Pinus muricata* and *Cupressus macrocarpa* make excellent shelter, and which to plant is mainly a matter of individual choice. The former is the hardier tree, whilst the latter is preferable for bottom shelter. There should be no necessity to use manure in raising pine-seeds. A well-worked finely prepared soil is the main thing necessary. In your locality the seed would be better sown early in September, and it might be found necessary later to shade the young plants from the sun.

ERADICATING TAUHINU.—LUCERNE ON STREAM-EDGES.

"RUNHOLDER," Kaikoura :—

1. When is the best time to burn the shrub tauhinu in order to kill it without unduly damaging the tussock ? Would rolling with a heavy roller have the effect of checking the growth, and breaking to assist burning where undergrowth is not sufficiently thick ?

2. If allowed to become established for about six months, will lucerne, sown broadcast in shingle and sandy soil on edges of a stream where white clover thrives, stand feeding for any length of time if not fed too hard ? Would the feed compensate for the seed ?

The Fields Division :—

1. Towards the end of March would be the best time to burn off the shrub tauhinu in order to kill it and cause a minimum of damage to the tussock. Rolling, where feasible, would have some effect in checking the growth and breaking to assist burning, particularly where tallish tauhinu is encountered.

2. As to whether or not the six-months-old lucerne will stand feeding off to any extent, and the feed compensate for the expenditure on seed, depends upon the extent of growth put up by the lucerne, which in turn depends upon the quality of the soil. If the soil is of fair quality and clovers grow well in it, a satisfactory stand of lucerne in all probability can be obtained in six or seven months' time, particularly if soil that has already grown the crop successfully is used for inoculating the soil. In the event of the lucerne becoming established, for the sake of the future productiveness of the crop it would not be wise to graze it for long, with sheep especially. Even under conditions of good soil-fertility, where lucerne would have every chance, it is not advisable to graze, except for a short period, in the first year of growth. In fact, grazing in the first year is a doubtful factor.

NON-BEARING LEMON-TREE.

"SUBSCRIBER," New Plymouth :—

Kindly tell me the possible cause of a lemon-tree not bearing which has been planted about three years ago. Flowers come on, but no fruit. The tree has grown well, and has had a lot of seaweed and basic slag mixed with the soil, which is black loam.

The Horticulture Division :—

Lemons when grown in a climate not highly suitable are invariably shy in setting fruit when young, but unless such adverse conditions are excessive age will probably overcome the difficulty.

BOARD OF AGRICULTURE.

THE Board of Agriculture held meetings in Wellington on Thursday and Friday, 26th and 27th October, when a number of matters which had been referred to it were dealt with.

A proposal which had been made to the Government, and by it sent on to the Board, to introduce stubble-quail into the Dominion was discussed. As the opinion had been expressed that the proposal, if given effect to, might adversely affect the farmer, it was decided to obtain further information from Australia regarding the habits of the bird before definitely advising the Government in the matter.

It was suggested to the Board that steps might be taken to get vendors of artificial manures to give with their price-lists guaranteed analyses in more simple terms. The matter, after being freely discussed, was referred to a sub-committee to inquire fully into, and to report to the Board at its next meeting.

Several communications regarding sites for the establishment of additional experimental farms were received, but it was decided to point out that the Board had already made recommendations to the Government in this direction, but they could not select any particular places for the farms, this being a question for the Government to decide.

A sub-committee was set up to make inquiries with regard to the carriage of lime for agricultural purposes on the railways, a number of complaints on the subject having been received from different parts of the Dominion.

A proposal that the Board should take steps to initiate a system of judging by points exhibits of live-stock, dairy-produce, cereals, farm-produce, &c., at the agricultural and pastoral shows in the Dominion was referred to a sub-committee to report to the Board at next meeting.

The various suggestions that had been made regarding suitable employment for returned soldiers was discussed, particularly a proposal that light employment might be found for a number of men who were physically incapable of hard work, by utilizing their services in the production of potash from seaweed, and arrangements were made to obtain reports on the subject from some of the leading experts of the Dominion.

Reports were received from the Board's representatives who waited on the Government in regard to the following matters: Purchase of meat and cheese by the Imperial Government; export of seedy and dirty wool to allied countries; removal of embargo on the export of hides; and demarcation in connection with forestry.

In addition to the foregoing, together with other matters of a confidential nature discussed, the following came up for consideration: Proposed summarizing, collating, and publishing of the results of agricultural experiments, and the setting-up of a soil survey; deposits of limestone; agricultural education; noxious weeds; and matters arising out of resolutions referred to the Board by the Council of Agriculture.

A number of other matters had to be deferred until the next meeting, as the Board had to attend the conference convened by the Minister in Charge of Imperial Supplies Branch to discuss the arrangements being made as to the disposal of frozen meat to the Imperial Government.

Information regarding Noxious Weeds.—For the purpose of securing information with regard to the six worst noxious weeds of arable lands and grass-lands throughout the Dominion, and the best methods for their eradication or prevention, the Board of Agriculture requests the co-operation of farmers and others on the land by completing a form which it is sending out for distribution by the Fields Inspectors of the Department of Agriculture. Any one desirous of co-operating with the Board in this matter can obtain a form from any of the Inspectors named, or from the Secretary of the Board, Wellington. It is desired that the forms should be completed and returned to Wellington not later than 16th December, 1916. The information it is specially desired to obtain is what weeds in each district are causing the greatest amount of harm; also particulars with regard to the methods of eradication which have been adopted in the district and have proved efficacious.

ESTIMATED AREAS UNDER WHEAT AND OATS: SEASON 1916-17.

THE following statement, dated 1st November, 1916, has been issued by the Government Statistician :—

In substituting for actual areas an estimate of the areas sown or to be sown in wheat and oats this season it is deemed advisable to give the following explanation as to the new system being adopted for the collection of these statistics and as to the method of arriving at the estimates here given.

Formerly the agricultural and pastoral statistics were collected in the spring-time, but in 1916 these statistics were obtained after the harvest; the collections during the past few years were made by means of returns through the post, but in 1916 there was a holding-to-holding canvass throughout the Dominion by police officers, acting as sub-enumerators.

The areas sown or intended to be sown are estimated in the spring-time, the information on which the estimate is based being obtained by issuing cards through the post to every grain-grower of the previous season. Such of these cards as are returned are tabulated, and the proportion which the total areas so returned as sown or intended to be sown bears to the total areas actually reaped in the previous harvest by those persons is applied over the whole areas reaped at the previous harvest, and the result is taken as the estimated area for the ensuing season.

This briefly is the new system which will be continued in future, and the principal differences between it and the previous system are that the actual areas reaped and the actual yields are obtained in the harvest-time, and the areas sown or intended to be sown are estimated in the spring-time; whereas previously the actual areas sown or intended to be sown were obtained in the spring-time and the estimated yields obtained in the harvest-time. The average yields were applied to the areas obtained in the spring, which resulted in the total actual yield for the Dominion being frequently stated inaccurately.

For the estimate now being prepared, cards were sent out by post to 26,000-odd grain-growers in the Dominion, asking them to state the areas of wheat and oats which they had sown or proposed to sow for the present season. Of these, over 24,000 cards have been returned to the office and duly tabulated, with the following results :—

In the North Island 19,197 acres were under wheat last year, and cards representing 15,416 acres (or 80 per cent.) of this area have now been returned to the Census and Statistics Office. The growers returning these cards state that they have sown or intend to sow 5,937 acres in wheat this year, and assuming that those growers who have not yet returned their cards sow proportionate areas, the total area in wheat for the 1916–17 season should be 7,395 acres. Treating the figures for oats on the same basis, it is estimated that a total of 76,208 acres will be grown this season.

Similarly, in the South Island 316,225 acres were under wheat in 1915–16. Cards representing 92½ per cent. of this area have been returned, and show a proposed 1916–17 area of 195,610 acres. It may therefore be assumed that in the South Island a total of 211,482 acres will be sown.

Oats harvested for all purposes in the South Island in 1915–16 covered 518,101 acres, and cards representing 91 per cent. of this acreage have been returned, showing an area of 428,379 acres. The estimated oat area for 1916–17 is therefore 472,318 acres.

The estimates are given in tabulated form below :—

WHEAT AND OATS.—AREA HARVESTED, 1915–16, AND AREAS ESTIMATED AS SOWN OR TO BE SOWN, 1916–17.

	Wheat. Acres.	Oats. Acres.
Actual area reaped, 1915–16—		
For threshing	329,207	212,688
For other purposes	6,216	427,539
Total	335,423	640,227
Estimated area sown for 1916–17 ..	218,877	548,526

AGRICULTURE ABROAD.

RURAL CREDIT IN THE UNITED STATES.

NEW GOVERNMENT MEASURE.

From the *Country Gentleman*, Philadelphia, U.S.A.

FOR fifty years the Federal Treasury has been coming nearer to the farmer's pocket. The common dependence of all industry upon the success of agricultural enterprise has been urged in support of this movement.

Government aid for agriculture was first expressed through the Morrill Act, establishing the agricultural colleges. Then the Hatch Act provided for the experiment stations. But these educational laws were opposed, on the ground that they were too paternalistic and were the beginning of a legislation that was dangerous. Some of those who expressed such ideas have lived to see the passage of the new Rural Credits Law, or Farm Loan Act, as it will be known, and have accepted the change of sentiment without much protest. The beginning of the change was evident two years ago, when the Smith-Lever Bill was passed, carrying an appropriation which will eventually amount to more than $25,000,000.

The new Farm Loan Act has not been without opponents, and even now, before the details have been worked out, there are prophecies of its failure to accomplish what the conditions require. The chief interest just now, however, is centred in the details of operation as provided for in the law, and in the action of the Board in adapting the law to conditions under which it must be operated.

President Wilson signed the Act on 17th July, and a few days later appointed the four members who, together with the Secretary of the Treasury, will constitute the Federal Farm-loan Board. The appointees are George W. Norris, of Pennsylvania; Herbert Quick, of West Virginia; W. S. A. Smith, of Iowa; and Charles E. Lobdell, of Kansas.

The law really provides for two systems: First, twelve regional land banks; second, joint-stock land banks. Both systems are under the supervision of the Federal Farm-loan Board, the members of which are appointed for two, four, six, and eight years respectively. Not more than two of the four are to be members of one political party. Each will devote his entire time to the work of the Board, and will receive a salary of $10,000, with travelling-expenses. One of the members will be designated by the President as Farm-loan Commissioner.

HOW THE BANKS WILL ORGANIZE.

The Board designates the territory for each of the twelve regional banks, and will set in motion machinery to organize them. The Board will also appoint officials for the various banks, provide for examinations and other details of that work, and issue bulletins from time to time to the Press to inform the public as to the progress of the organization of the system.

Each district land bank will have a subscribed capital stock of not less than $750,000, each share $5. Each Federal land bank may establish branches in its district. Within thirty days after the capital stock is offered for sale it may be purchased at par by any one. Thereafter the stock remaining unsold shall be bought by the Secretary of the Treasury for the United States. It is provided, however, that the Government shall not receive any dividends on its stock. It is intended that eventually all the stock in the banks shall be owned by the associa-

tions of borrowers, and provision therefor is made in the law for transferring the original stock at par to these associations.

After a Federal land bank has loaned $50,000 on first mortgage it can obtain permission from the Farm-loan Board to issue $50,000 in farm-loan bonds based upon these mortgages, to sell such bonds in the open market, and to use the money thus obtained to lend on other mortgages. The process of lending on mortgages and selling bonds in issues of $50,000 may be repeated until bonds to the amount of twenty times the bank's paid-up capital are outstanding. Even in the event that each bank has only its required minimum paid-up capital of $750,000, this plan will eventually provide, if all the authorized bonds of the twelve banks are sold, $180,000,000 to lend on first mortgages on farm land. The banks, however, can increase their capital stock above the required minimum, and so increase the amount of bonds they can sell and the total amount of money available for loans on farm mortgages.

To make these bonds attractive to investors the bonds, together with the mortgages upon which they are based, are exempted from Federal, State, municipal, and local taxation, and are made legal investments for fiduciary and trust funds. The capital stock of the Federal land banks is also exempt from taxation. Federal reserve banks and member banks of that system are empowered to buy and sell these bonds, which are to be issued in denominations of $20, $50, $100, $500, and $1,000.

The Act provides for the creation of local national farm-loan associations, through which it is contemplated that the Federal land banks shall make their loans. Ten or more persons who own and cultivate farm land qualified as security for a mortgage loan under the Act, or who are about to own and cultivate such land, may form such an association, provided the aggregate of the loans desired by the membership is not less than $20,000. Each member must take stock in his association to an amount equivalent to 5 per cent. of the amount he wishes to borrow. This stock the association holds in trust as security for the member's individual loan. The association, in turn, when applying for money from the bank, must subscribe for stock in the bank to an amount equivalent to 5 per cent. of the sum it wants to obtain for its members. This stock is held in trust by the bank as security for the loans it makes through the association.

If a prospective borrower has no money with which to pay for his association stock, he may borrow the price of that stock as a part of the loan on his farm land. Under this plan every borrower must be a stockholder in his local association, and every association a stockholder in its district bank. Each stockholder in an association is liable for the acts of that association up to twice the amount of the stock he owns.

Other agents may also be used. Incorporated banks, trust companies, mortgage companies, or chartered savings institutions may act as agents for Federal land banks if no farm-loan association has been formed in a given locality after one year.

Borrowers securing loans through agents are required to subscribe 5 per cent. of their loans to the capital of the Federal land bank.

Agents are entitled to a commission of a half of 1 per cent. per annum on unpaid principal of each loan they negotiate, and the bank pays the agent for actual expenses in appraising land, examining titles, executing and recording the mortgage papers, which shall be added to the face of the loan.

Agents will endorse and become liable for the payment of the loans they negotiate, and the aggregate unpaid principal of such loans shall not exceed ten times the agent's capital and surplus. Agents are required to make good any default within thirty days after notice.

THE WAY A LOAN IS SECURED.

To obtain a loan a member of a national farm-loan association must apply to a loan committee of the association, which must appraise the property offered as security. If the application is approved by the loan committee, it is then forwarded to the Federal land bank, and must be investigated and reported on by a salaried appraiser of the bank before the loan is granted. This appraiser is required to investigate the solvency and character of the prospective borrower, and to report also on the value of his land.

When a loan is granted the amount is forwarded to the borrower through the loan association.

The purposes for which loans may be obtained are—

(*a.*) To provide for the purchase of land for agricultural uses:

(*b.*) To provide for the purchase of equipment, fertilizers, and live-stock necessary for the proper and reasonable operation of the mortgaged farm:

(*c.*) To provide buildings and for the improvement of farm lands:

(*d.*) To liquidate indebtedness of the owner of the land mortgaged, existing at the time of the organization of the first national farm-loan association established in or for the country in which the land mortgaged is situated, or indebtedness subsequently incurred for one of the purposes mentioned in this section.

No individual can borrow more than $10,000 or less than $100, or more than 50 per cent. of the value of the land mortgaged and 20 per cent. of the value of the permanent insured improvements upon it. The loan must run for not less than five and not more than forty years.

Every mortgage must provide for the repayment of the loan under an amortization plan by reason of a fixed number of annual or semi-annual instalments sufficient to meet all interest and to pay off the debt by the end of the term of the loan. No Federal land bank is permitted to charge more than 6 per cent. per annum on its farm-mortgage loans, and in no case shall the interest charged on farm mortgages exceed by more than 1 per cent. the rate paid on the last issue of bonds. For example, if the bank pays only 4 per cent. on an issue of bonds, it cannot charge more than 5 per cent. for the next farm loan it makes. Out of this margin of not more than 1 per cent., together with such amounts as it can earn on its paid-in cash capital, the bank must set aside certain reserves and meet all its expenses.

Any balance or net profits may be distributed as dividends to the loan associations or other stockholders. The loan associations, from their bank dividends, after setting aside the required reserves and meeting expenses, may declare association dividends to their members. In this way the profits, if any, will be distributed among the borrowers, and will to that extent reduce the amount of interest actually paid by them.

THE JOINT-STOCK LAND BANKS.

The second part of the system provides for the establishment of joint-stock land banks, and authorizes them to carry on the business of lending directly to the borrowers on farm-mortgage security and issuing farm-loan bonds. These banks must have capital of not less than $250,000 each. They are under the supervision of the Federal Farm-loan Board, but the Government does not lend them any financial assistance.

The joint-stock land bank is free from many of the conditions imposed upon the Federal land banks. Subject to the 50- and 20-per-cent. value limitation and the limitation as to territory, the joint-stock land bank may lend more than $10,000 to a single individual, but it is not restricted to making loans for the purposes specified in the case of the Federal land bank. These banks can lend to any one on land that is not farmed by the borrower. Presumably their aid is for development in the newer sections.

The joint-stock bank, like the Federal land bank, cannot charge an interest-rate on farm mortgages in excess of 6 per cent., nor shall such interest-rate exceed by more than 1 per cent. the rate of interest paid by the bank upon its last issue of bonds. A joint-stock bank is limited in its bond issue to fifteen times its capital and surplus. The bonds of the joint-stock land banks are exempt from taxation. Their capital stock, however, is not exempt.

MISCELLANEOUS.

The law provides the necessary machinery for frequent examinations of the banks and the associations, for the proper cancellation of mortgages, and for the safe custody of mortgages offered as security for bonds. When any mortgage offered as security for bonds is withdrawn the bank is required to replace the security with other mortgages or with other collateral that is considered satisfactory.

Heavy penalties of fine or imprisonment, or both, are imposed for violations of the Act, malfeasance in office, fraud, embezzlement, defalcation, or other illegal practices.

CONTROL OF PRICE OF BUTTER IN NEW ZEALAND.

THE report of the New Zealand Board of Trade on the butter position, dated Wellington, 11th October, 1916, embodying the scheme under which a maximum price has been fixed for butter for local consumption and a fund established to compensate those dairy concerns supplying the local market, is reproduced below for general information and reference.

Formally addressing His Excellency the Governor, the Board states as follows:—

1. Since the Board's appointment in March of this year numerous complaints have been received that the consumer in New Zealand is paying an unreasonably high price for butter. The Board in consequence has made extensive inquiries into all phases of the butter question. Evidence was taken from representative traders and producers in Wellington, Auckland, Thames, Christchurch, and Dunedin, and reports and statistics dealing with the world's markets were considered.

2. During the winter months restrictions were placed by the Government on the export of butter, but in spite of these restrictions the local wholesale price moved in sympathy with the world's markets, and the retail price went from 1s. 6d. in March to 1s. 7d. in June and 1s. 8d. in August. Even this price did not bring the local wholesale price during the period covered by our investigations up to the f.o.b. equivalent, as the retail price of butter would have needed to be by the end of September 1s. 10d. Since the beginning of the war the factories supplying the local markets have done so at a disadvantage as compared with export of from ½d. to 1⅝d. per pound, as the following table will show:—

TABLE SHOWING MARGIN IN FAVOUR OF BUTTER FOR EXPORT.

Month.	Net Price to Retailers, per Pound.	Net Price to Factories, per Pound.	Export Value, per Pound.	Margin in favour of Export, per Pound.
1914–15.	s. d.	s. d.	s. d.	s. d.
September to March ..	1 1½	1 0⅝	1 1⅛	0 0½
1915.				
April	1 3	1 2⅛	1 3½	0 1⅜
May	1 5	1 4⅛	1 5½	0 1⅜
June	1 5	1 4⅛	1 5½	0 1⅜
July	1 6	1 5⅛	1 6¼	0 1
August	1 5	1 4⅛	No exports	..
September	1 3	1 2⅛	1 3¼	0 1⅛

NOTE.—Average disadvantage on local market for twelve months as compared with net return from other markets, 0·82d. per pound.

September to March represents prices realized in British markets; April to July represents prices realized on sales to Australia; September represents prices paid for shipments to London.

Month.	Net Price to Retailers, per Pound.	Net Price to Factories, per Pound.	Export Value, per Pound.	Margin in favour of Export, per Pound.
1915–16.	s. d.	s. d.	s. d.	s. d.
September to March ..	1 3⅝	1 2⅜	1 3	0 0¼
April	1 4	1 3⅛	1 3¾	0 0⅝
May 6	1 4	1 3½	..	..
May 31	1 5	1 4⅛	1 4	..
June	1 5	1 4⅛	1 4½	0 0⅜
July	1 5	1 4⅛	1 4⅜	0 0¼
August 1 to 9	1 5	1 4⅛	1 5	0 0⅞

NOTE.—Average disadvantage on local market for nearly twelve months as compared with net return from other markets, 0·33d. per pound.

September to April represents prices realized in British markets; May to June represents prices realized on sales to Australia; July to August represents prices paid for shipments to London.

3. By the middle of August it had become apparent that, owing to the world's supplies of butter and cheese being inadequate to meet the demand, further advances in price in the London market were inevitable. Up to the 30th June, 1916, there was a shortage of 41,939 tons (or 25 per cent.) as compared with the previous year, and a shortage of 74,439 tons (or 33·4 per cent.) as compared with 1911, the year in which imports of butter into Great Britain reached their maximum. Consequently this season opened with offers for New Zealand butter at prices that eclipsed all previous records.

4. New Zealand's consumption of butter is approximately 10,000 tons; its production of butter is approximately 30,000 tons: its exportable surplus is therefore 20,000 tons per annum. Some few factories produce exclusively for the local trade, most factories exclusively for the export trade, and a few do both local and export trade. All the factories are keen competitors for supplies of butter-fat, and it therefore follows that those factories which are unable to give ruling prices for butter-fat will be driven in time out of business. If the price received by factories catering for the local market is lower than the export value, these factories are placed at a decided disadvantage in procuring supplies. The position is further complicated by the competition of cheese-factories for butter-fat, and as there is no restriction on the export of cheese to British ports, and cheese is bringing record prices in London, the cheese-factories are able to offer exceptionally high prices for butter-fat.

5. On the 11th August a deputation of grocers waited upon the Board and informed the Board that, as an advance in the wholesale price was apparently about to take place, they could no longer distribute butter retail for the margin of 2d. between the wholesale and retail price. They stated that when the wholesale price was 10d. per pound the retail price was 1s.—a difference of 20 per cent.; when the wholesale price was advanced to 1s. 6d. the retail price was 1s. 8d.—a difference of only 11⅛ per cent. The average cost of running a retail grocery business now was 12½ per cent. on the turnover, consequently they were handling butter at a loss. The position, they alleged, was even worse than these figures show, as the retail price of butter in some centres was subject to a discount of 2½ per cent., or ½d. per pound, on all monthly accounts. The grocers further pointed out that their loss would be much greater if another advance was made in the wholesale price and the retail price was merely increased by the same amount. They asserted that, in justice to the trade, if a further wholesale advance took place a percentage advance would therefore have to be made on the retail price to cover working-expenses and a reasonable profit. Thus, if the wholesale price were advanced from 1s. 6d. to 1s. 7d. the retail price should, in fairness to them, be advanced from 1s. 8d. to 1s. 10d., less, of course, the usual discount of 2½ per cent., making the net price 1s. 9½d., approximately. They agreed, however, to maintain the present price pending action by the Board. The Board, however, is not convinced on the evidence at present submitted by the grocers that they are handling butter at an actual loss, but it is quite clear that they are not now obtaining the same rate of profit as in pre-war years. We are satisfied that the 2d. per pound has not been at any time an excessive charge for distribution.

The following table shows the movement of retail prices. The local wholesale price is on an average 3d. less :—

MONTHLY RETAIL PRICES OF BUTTER SOLD IN WELLINGTON DURING THE FOLLOWING PERIODS.

1914.	s.	d.	1915.	s.	d.	1916.	s.	d.
..			January ..	1	4	January ..	1	5
..			February ..	1	4	February ..	1	5
..			March ..	1	4	March ..	1	6
..			April	1	6	April	1	6
..			May	1	7	May	1	7
..			June	1	7	June	1	7
July	1	3	July	1	9	July	1	7
August	1	3	August ..	1	7	August ..	1	8
September ..	1	3	September ..	1	5	September ..	1	8
October ..	1	3	October ..	1	5	October ..	1	8
November ..	1	3	November ..	1	5	..		
December ..	1	3	December ..	1	6	..		

7. The local wholesale distributors were subsequently summoned before the Board and gave evidence upon oath. They stressed the fact that the factories at present catering for the local trade were receiving less than the average export value. This was an impossible position, as they were unable to return to their suppliers the same figure per pound for butter-fat as those factories which were exporting, or as cheese-factories were paying, and in consequence their supply of butter-fat was endangered. A study of the table given in paragraph 2 confirms this contention. They agreed, however, to make no advance until the Board had had time to thoroughly investigate the position.

8. To illustrate what this means to a factory doing a local instead of an export trade, the Board was advised that the monetary disadvantage to a particular co-operative factory was at the rate of £3,600 per year. The evidence adduced was sufficient to convince the Board that the present conditions could not continue, that the factories producing for the local trade were placed at an unfair advantage, and would be compelled in justice to themselves either (1) to bring the local price on a parity with the f.o.b. price, (2) to enter the export trade, or (3) go out of business, as their supplies would be diverted to the export factories and to the cheese-factories.

9. On the 22nd August the Board found that the f.o.b. offers for August and September were equivalent to 1s. 5¼d. per pound, and that the September offers were 1s. 6d., with a tendency to rise. The average cost of preparing the butter from bulk to pounds, including patting, wrappers, collection from railways, deliveries to grocers, booking, travellers' expenses, and bad debts, was ¾d. to ⅞d. per pound. The local wholesale equivalent for August was therefore 1s. 6d. per pound, and for September 1s. 6¾d. to 1s. 7d. Allowing the grocers' present cost of distribution, the September retail price to be on a parity with the f.o.b. equivalent should have been 1s. 9d.

10. On the Board's return to Wellington from the South further interviews took place with the local distributors and grocers, and as a result a joint deputation of representative producers, distributors, and grocers waited upon the Board, the President (Hon. W. D. S. MacDonald) in the chair. The Hon. Mr. Myers (Minister of Customs) was invited to attend, and was also present. The following questions were discussed:—

(*a.*) Removal of the restrictions on the exportation of butter.

(*b.*) Necessity of raising the price on the local market to bring it into a parity with the export value.

(*c.*) Necessity of increasing the margin between wholesale and retail prices.

11. A sub-committee was appointed, representing all interests, to discuss the matter in detail with the Board. The appointed members of the Board have carefully considered the whole of the facts submitted, and are of opinion,—

(*a.*) That the restrictions on export, while vexatious to traders, have not kept the price down in the local market.

(*b.*) That the disparity on the 1st October between f.o.b. and local prices was from 1½d. to 2d. per pound.

(*c.*) That it is inequitable to expect factories supplying the local market to bear the whole of this difference, as it would represent a loss to these factories on the season's output equivalent to £186,000 on a disparity of 2d. per pound.

(*d.*) That unless Governmental action of some sort is taken an increase in the New Zealand retail price to 1s. 10d. or 1s. 11d. per pound is unavoidable.

12. The position therefore appears to the Board to resolve itself into—

(*a.*) Allowing values to adjust themselves in the ordinary course of trade; or

(*b.*) Government action with a view to regulating local prices.

13. Is it desirable to allow values to adjust themselves in the ordinary course of trade? As shown above, this would mean that the retail price of butter would instantly rise to 1s. 10d. or 1s. 11d., a position which the Board of Trade feels should be avoided if possible, in view of the fact that New Zealand produces butter greatly in excess of its requirements; that its surplus of butter and cheese is exportable at the present high prices only because of the exceedingly favourable conditions as to freight and space secured by the representations of the Government to the Imperial Board of Trade; and that the producers owe in return some consideration to the New Zealand consumer. It is fair to ask what the local price of butter and cheese would be without possibilities of shipments to London.

14. The Board has come to the conclusion that the retail price of butter should not be allowed to rise indefinitely, and for the following reasons re-

commend that the price should be in the vicinity of 1s. 7d. throughout New Zealand :—

(*a.*) The retail selling-price in October, 1914, was 1s. 3d., in 1915 1s. 5d. (even these were high prices in comparison with previous summer prices).

(*b.*) The increase of 2d. per pound in the retail price as compared with October, 1915, is more than sufficient, in the Board's opinion, to cover any extra cost of production that has accrued since.

(*c.*) If 1s. 7d. is exceeded, difficulties will arise in connection with the summer supply of milk for domestic use throughout New Zealand. Already the price charged for milk is abnormally high for the flush of the season, and is creating a good deal of discontent. Economy, due to high price, in the use of milk for human consumption is not desirable, on the ground of public health.

(*d.*) The price in the Commonwealth of Australia is fixed at 1s. 6d. retail.

(*e.*) If butter is retailed at 1s. 7d. the grocers will be satisfied with the present distributing-charges.

(*f.*) Medical men have informed the Board that butter is an absolute necessity in the home, and that many children are not receiving the quantities requisite for their proper and physical development.

15. Assuming that the Government is prepared to take action with a view to regulating the price on the local market, the appointed members of the Board have considered various possible courses now available, and after the elimination of impracticable schemes recommend as follows :—

(*a.*) The prohibition of export of butter and cheese except under license on the terms and conditions submitted in a separate memorandum attached to this report.

(*b.*) The fixation of a maximum wholesale price from time to time at the factory for butter for local consumption.

(*c.*) Distributing-charges not to exceed those ruling in the trade as on the 1st August, 1914.

16. Should the scheme outlined in the report and the attached memorandum be adopted by the Government, the Board would further recommend the removal of all other restrictions on the export of butter.

17. The scheme would be fruitless if made to apply to butter only, as the threat has been constantly used that manufacturers would manufacture cheese in its place, and butter-fat would be diverted to cheese-factories.

We append a schedule showing f.o.b. equivalent per pound of prices realized for New Zealand butter in bulk in London.

MEMORANDUM REFERRED TO IN PARAGRAPH 16.

1. On and after the export of butter and cheese will be prohibited except under license.

2. All factories desiring a license to export either butter or cheese shall make application for permission to do so to the officer in charge of the Imperial Government Supply Department, General Post Office, Wellington, on the prescribed form.

3. Licenses shall be issued by the Imperial Government Supply Department, General Post Office, Wellington.

4. Every applicant for a license shall sign an agreement embodying the following terms and conditions :—

(*a.*) That he will furnish to the Imperial Government Supply Department monthly a return on a prescribed form showing the quantity of butter-fat received at the applicant's factory as from the 1st September, 1916. The returns for the month of September to be furnished forthwith, and each subsequent return not later than the 7th of each succeeding month.

(*b.*) That he undertakes to pay in respect of such butter-fat such charge per pound as may be fixed from time to time by Order in Council.

(*c.*) That he undertakes to furnish to the Imperial Government Supply Department the quantity in pounds of butter boxed for export, and the quantity boxed for local consumption during the same period.

(*d.*) That he undertakes to furnish to the Imperial Government Supply Department the name of the firm or individual to whom the butter for local consumption is supplied. In case the licensee is not the exporter, he shall supply the name of the firm or individual to whom the butter is delivered or sold.

(*e.*) That every applicant for a license shall brand all boxes of butter either as being for export or for local consumption, as the case may be. Such brands shall be supplied on application to the Director of the Dairy Division.

(*f.*) Applicant shall also undertake to furnish to the Imperial Government Supply Department such further particulars as may be required from time to time, and to allow an accredited official of the Department to inspect the books, accounts, and records of applicant's factory in so far as they relate to the receipt and disposal of butter-fat, butter, and cheese.

5. Where in the opinion of the Imperial Government Supply Department the circumstances require it, a statutory declaration verifying the particulars supplied may be demanded.

6. Payment by a licensee under the terms of the aforesaid agreement shall be made within seven days of the receipt of a notification from the Imperial Government Supply Department of the amount due, such payments to be made to the Imperial Government Supply Department, Wellington, direct.

7. Failure to comply with any of the terms of the agreement or the regulations shall render the license liable to forfeiture, in addition to the penalties prescribed under the Regulation of Trade and Commerce Act, 1914, and amendments thereto, and the Customs Act, 1913.

8. Moneys paid under paragraph 6 shall be available for distribution to factories supplying the local market on the basis of the quantities of butter supplied for local consumption.

9. Before any factory can participate in the distribution mentioned in clause 8 it must contribute to the Imperial Government Supply Department a sum per pound of butter-fat entering the factory equivalent to the charge made for license to export, and it shall furnish to the Imperial Government Supply Department the monthly return as required in clause 4.

10. Where at any time it is intended to transfer butter marked for local consumption to export it shall be necessary to obtain the permission of the Director of the Dairy Division, who shall furnish a return showing the quantity transferred and the name of the factory producing the same to the Imperial Government Supply Department, and such butter shall not be taken into account in the distribution referred to in clause 8.

11. Nothing in the scheme shall apply to milled butter, whey butter, farmers' dairy butter, farmers' cheese.

12. Supplies for military requirements, either for camps or transports, to be classed as locally supplied butter.

TABLE SHOWING THE F.O.B. EQUIVALENT PER POUND REALIZED FOR NEW ZEALAND BUTTER IN BULK IN LONDON.

London Wholesale Price per Cwt.	F.o.b. Equivalent per Pound in N.Z.	London Wholesale Price per Cwt.	F.o.b. Equivalent per Pound in N.Z.	London Wholesale Price per Cwt.	F.o.b. Equivalent per Pound in N.Z.
s.	d.	s.	d.	s.	d.
170	16·22	182	17·44	194	18·65
171	16·32	183	17·54	195	18·75
172	64·42	184	17·64	196	18·85
173	16·52	185	17·74	197	18·96
174	16·63	186	17·84	198	19·06
175	16·73	187	17·94	199	19·16
176	16·83	188	18·04	200	19·26
177	16·93	189	18·14	201	19·36
178	17·03	190	18·25	202	19·46
179	17·13	191	18·35	203	19·56
180	17·23	192	18·45	204	19·66
181	17·33	193	18·55		

NOTE.—Cost of patting, &c., for local market averages ¾d. per pound, which charge must be added to f.o.b. to get wholesale local parity prices.

The retail price under present conditions to be on a parity with f.o.b. prices would need to be 3d. higher.

OPERATION OF THE SCHEME.

The scheme outlined by the Board was put into operation by the Government by means of Orders in Council under the Regulation of Trade and Commerce Act, 1914, and the Customs Act, 1913, dated the 13th October, 1916. The maximum wholesale price of butter at the factory was fixed for the time being at 149/4 per hundredweight (1s. 4d. per pound). The charge payable by butter-export license-holders on butter-fat consumed by them in the manufacture of butter or cheese was fixed at ¾d. per pound, or such other rate as may be determined by the licensing authority, with the approval of the Board of Trade, and duly gazetted. It was provided that the licensing authority should be an officer of the Government service nominated by the Minister of Agriculture, and Mr. R. Triggs, Wellington, has been appointed. A "Working Arrangement" has also been devised for the detailed operation of the scheme.

COMMERCIAL INTELLIGENCE.

LONDON WOOL-SALES.

FOLLOWING are the High Commissioner's cabled reports regarding the seventh series of London wool-sales:—

24/10/16.—The sales have opened with a strong competition and a large attendance of buyers. There is an active demand by Home buyers, but Continental buyers are quiet. There is a good demand for all kinds of wool. Greasy wool is scarce and has advanced a halfpenny on the closing rates of last sales. The total net quantity of New Zealand wool available is 68,250 bales, mostly scoured and slipe.

10/11/16.—The sales have closed firm for all kinds of wool. The market is good, owing largely to shortness of supplies, and has advanced rapidly during this week. Estimated closing values are as follows: Fine crossbreds, 1s. 10d. to 2s. 2d.; medium crossbreds, 1s. 6d. to 1s. 9½d.; coarse crossbreds, 1s. 4½d to 1s. 8d.; superior merino, 1s. 11d. to 2s. 3d.; medium merino, 1s. 7d. to 1s. 10½d.; inferior merino, 1s. 3d. to 1s. 6½d.

GRADING OF "HIGH-FAIR" NEW ZEALAND HEMP.

As a result of representations made at a recent conference between representatives of the hemp-millers and the Department, it was decided that "high-fair" grade hemp—that is, hemp scoring from 65 to 69 points—be definitely recognized as a separate grade, and certificates and reports to millers issued and tags on the bales stamped accordingly. The grading was brought into force as soon as the necessary notification had been made to hemp-millers throughout the Dominion—*i.e.*, towards the end of October.

AGRICULTURAL STATISTICS OF ENGLAND AND WALES.

THE Preliminary Statement of the Agricultural Returns for England and Wales, collected in June last, as published in a memorandum by the English Board of Agriculture, shows an increase of 20,760 acres in the total area under crops and grass. In arable land there was an increase of 85,190 acres, largely in the place of permanent grass, which shows a decline of 64,430 acres. The area under wheat shows a reduction, the total area, 1,912,000 acres, being a quarter of a million acres less than in 1915. The total is, however, much greater than in recent normal years, and (except for 1915) is the highest since 1899. Barley shows a recovery of 100,000 acres from the low record of 1915; but oats show scarcely any change. Beans and peas show considerable reductions, the area under these two pulse crops being about seven-eighths of that returned in 1915. Potatoes and mangels have both fallen off by some 35,000 acres, but turnips and swedes increased slightly. Although the area under permanent grass shows a decline,

that portion reserved for hay shows a large increase—viz., of 175,000 acres; clovers and rotation grasses show an even greater increase, the total under this crop being 228,000 acres more than last year. Taking all categories of clover and grass, the increase in the area for mowing, as compared with 1915, is 400,000 acres.

All classes of horses show an increase, the total of 1,359,570 being over 72,000 more than in 1915; the greatest relative change is in the young stock under one year of age. Cattle show a rise of over 151,000, and the total number (6,215,780) is the largest ever recorded in England and Wales. The increase is chiefly among the heifers in calf and the fattening cattle; cows in milk show a small decrease. All categories of sheep (total 17,951,120) are more numerous than last year, the augmentation being 429,000. Pigs (2,167,940), on the other hand, show a drop of about 10 per cent., and are practically at the level of 1913.

EXPORTS TO UNITED KINGDOM.

EXPORTS from New Zealand to the United Kingdom during October, 1916, included the following: mutton, 190,290 carcases; lamb, 132,429 carcases; beef, 60,670 quarters; butter, 50,667 boxes; cheese, 34,459 crates; wool, 11,600 bales; wheat, 12,596 sacks; rabbits, 11,599 crates; hemp, 8,417 bales; tow, 5,786 bales; kauri-gum, 2,138 packages. The usual table is crowded out of this issue.

STOCK EXPORTED.

THE following table shows the numbers and descriptions of stock exported from the Dominion during the month of October, 1916:—

Port of Shipment.	Horses.		Sheep.			Cattle.		Pigs.	
	To Australia.	To Eastern Pacific.	To Australia.	To Eastern Pacific.	To San Francisco.	To Australia.	To Eastern Pacific.	To Eastern Pacific.	To Australia.
Auckland ..	..	..	..	99	..	..	19	42	1
Gisborne ..	..	..	..	..	..	18	..	..	..
Napier ..	..	..	..	..	..	17	..	..	..
Wellington ..	..	..	16	..	6	..	..	..	..
Lyttelton ..	..	..	..	..	90	..	..	..	..
Totals ..	..	..	16	99	96	35	19	42	1

STOCK IN QUARANTINE.

THE following stock was received into quarantine during the month of October, 1916:—

No.	Description.	Sex.	Port of Origin.	Owner or Agent.	Address.
		MOTUIHI ISLAND (AUCKLAND).			
1	Jersey bull ..	Male ..	London ..	A. Moreland ..	Papatoetoe.
		QUAIL ISLAND (LYTTELTON).			
1	Shorthorn bull..	Male ..	London ..	J. C. N. Grigg ..	Longbeach.
1	Collie bitch ..	Female	,, ..	James Lillico ..	Lochiel.
2	,, pups ..	,,	,, ..	,, ..	,,
3	,, ,, ..	Male ..	,, ..	,, ..	,,

LONDON MARKET VALUES.

COMPARATIVE STATEMENT COMPILED FROM THE HIGH COMMISSIONER'S CABLES FOR THE PAST THREE MONTHS.

London Date.	Wool. Bradford Quotations for Tops. 36's.	40's.	44's.	50's.	56's.	60's.	Mutton. Canterbury.	Mutton. North Island.	Lamb. Canterbury.	Lamb. Other than Canterbury.	Beef. New Zealand Hinds.	Beef. New Zealand Fores.	Butter. Danish.	Butter. New Zealand.	Cheese. New Zealand White.	Cheese. New Zealand Coloured.	Cheese. Canadian.	Hemp (Spot). New Zealand Good-fair.	Hemp (Spot). New Zealand Fair.	Hemp (Spot). Manila Fair (New Grade).	Hemp (Forward Shipment). New Zealand Good-fair.	Hemp (Forward Shipment). New Zealand Fair.	Hemp (Forward Shipment). Manila Fair (New Grade).	Wheat. N.Z. Short-berried.	Wheat. N.Z. Long-berried.	Oats. N.Z. Sparrowbills.	Oats. N.Z. Danish.
							d.	d.	d.	d.	d.	d.															
1916.																											
Aug. 12	..	..	..	..	..	..	*8⅛	..	*9½	..	5¼	4¼	195/0	176/0	96/6	94/6	95/0	49/0/0	46/10/0	51/10/0	48/10/0	46/0/0	..	..	..	..	..
,, 21	..	..	..	..	..	..	*8⅛	..	*9½	..	5⅛	4¼	198/0	178/0	97/10	96/0	96/10	48/10/0	46/10/0	51/10/0	47/10/0	45/10/0	51/0/0	..	..	..	..
,, 28	..	..	..	..	..	..	*8⅛	..	*9½	..	..	..	203/0	184/10	101/0	101/0	102/0	48/10/0	46/10/0	51/10/0	48/0/0	46/0/0	51/0/0	..	..	..	..
Sept. 4	..	..	..	..	..	..	*8⅛	..	*9½	..	..	..	197/0	186/10	103/0	103/0	103/10	49/10/0	47/10/0	52/0/0	49/0/0	47/0/0	51/0/0	..	..	..	..
,, 11	..	..	..	..	..	..	*8⅛	..	*9½	..	..	..	196/0	186/10	104/0	104/0	..	49/10/0	47/10/0	51/10/0	48/10/0	48/10/0	50/10/0	..	..	..	..
,, 16	..	..	..	..	..	..	*8⅛	..	*9½	..	5½	4¼	197/0	187/0	105/0	105/0	105/0	49/10/0	47/10/0	52/0/0	49/0/0	47/0/0	51/0/0	..	..	..	..
,, 23	..	..	..	..	..	..	*8⅛	..	*9½	..	..	..	202/0	191/0	105/0	105/0	106/0	50/0/0	48/0/0	52/0/0	49/10/0	47/10/0	51/10/0	..	..	..	..
,, 30	..	..	..	..	..	..	*8⅛	..	*9½	..	..	..	207/0	200/0	107/0	107/0	108/0	50/0/0	48/0/0	52/0/0	49/10/0	47/0/0	..	..	..	..	..
Oct. 7	..	..	..	..	..	..	*8⅛	..	*9½	..	6½	5½	211/0	198/6	109/0	109/0	111/0	50/0/0	48/0/0	52/0/0	49/10/0	47/0/0	51/10/0	..	..	*33/0	..
,, 14	..	..	..	..	..	..	*8⅛	..	*9	..	†7½	†6½	210/0	199/0	111/0	111/0	113/0	50/10/0	48/10/0	52/10/0	50/0/0	48/0/0	52/0/0	..	..	*34/6	..
,, 21	..	..	..	..	..	..	*8⅛	..	*9½	..	†7½	†6½	208/0	197/0	111/0	111/0	113/0	52/10/0	50/0/0	54/0/0	52/0/0	50/0/0	53/10/0	..	..	*36/6	..
,, 28	..	..	..	..	..	..	*8⅛	..	*9½	..	..	..	212/0	199/0	112/6	112/6	115/0	53/0/0	51/0/0	54/0/0	52/10/0	50/10/0	53/10/0	..	..	*37/0	..
Nov. 4	..	..	..	..	..	..	*8⅛	..	*9½	..	‡7¼	‡6½	216/0	202/0	113/6	..	115/0	53/0/0	51/0/0	54/10/0	52/0/0	50/0/0	53/10/0	*76/	..	*38/0	..
,, 11	..	..	..	..	..	..	*8⅛	..	*9½	..	7⅛	6¼	217/0	203/0	..	..	118/0	53/0/0	51/0/0	54/10/0	52/0/0	50/0/0	53/10/0	..	..	*40/0	..

* Specified as "New Zealand." † N.Z cow-beef. ‡ N.Z. ox-beef.

NOTE.—The above beef quotations, unless otherwise specified, are for "N.Z. bull-beef."

Summer.